

TECHNICAL DRAINAGE STUDY

for
Golden Valley Ranch
Mohave County, AZ
Area 3

Prepared for:

Rhodes Homes Arizona, LLC.

2215 Hualapai Mountain Rd., Suite H

Kingman, Arizona 86401



Stanley Consultants INC

A Stanley Group Company
Engineering, Environmental and Construction Services - Worldwide

Technical Drainage Study

For

**Area 3,
Golden Valley Ranch
Mohave County, AZ**

**March 2006
SCI Project # 18449.00.00**

Prepared for:

**Rhodes Homes Arizona, LLC.
2215 Hualapai Mountain Road, Suite H
Kingman, Arizona 86401**

Prepared By:

**STANLEY CONSULTANTS, INC.
5820 South Eastern Avenue, Suite 200
Las Vegas, Nevada 89119
(702)369-9396
Fax (702)369-9793**



GOLDEN VALLEY RANCH

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GOLDEN VALLEY RANCH

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GOLDEN VALLEY RANCH

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(See Grading Plans this Project)**

GOLDEN VALLEY RANCH

1. GENERAL LOCATION AND DEVELOPMENT DESCRIPTION

1.1. Introduction

This study is submitted as the technical drainage study for the proposed improvement plans of Area 3, of the Golden Valley Ranch residential development located in the Sacramento Valley of Mohave County, Arizona, more specifically on the south side of the Golden Valley Community, near Kingman. Area 3 comprises of approximately 90 acres of the total 5,800 acres of land located in the Golden Valley Ranch.

The purpose of this study is to evaluate the storm drainage infrastructure of the proposed Area 3 development.

This study is divided into four separate areas of consideration. They are as follows:

- A general overview of site drainage
- A detailed analysis of the proposed storm drainage infrastructure.
- An analysis of the drainage improvements in the Public Right-of-Way.
- An evaluation of interim facilities serving the site

1.2. Location

The Golden Valley Ranch project site consists of Taxpin Numbers 215-01-048, 215-01-075, 215-01-078, 215-01-079, 215-01-080, 215-01-084, 215-01-085, 215-01-092, & 215-15-005 within Township 20 North, Range 18 West and Township 21 North, and Range 18 West, G&SRM, Mohave County, Arizona (Figure 1 - Vicinity Map and Regional Drainage Scheme).

1.3. FEMA Flood Hazard Zone

Figure 2 is a representation of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Mohave County, AZ, map number 040058 2325C, dated October 20, 2000. Of the 205 acres of Area 1, 22 acres lies in Special Flood Hazard Zone A.

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study (FIS) by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no Base Flood Elevations (BFE's) or depths are shown within this zone. Mandatory flood insurance purchase requirements apply.

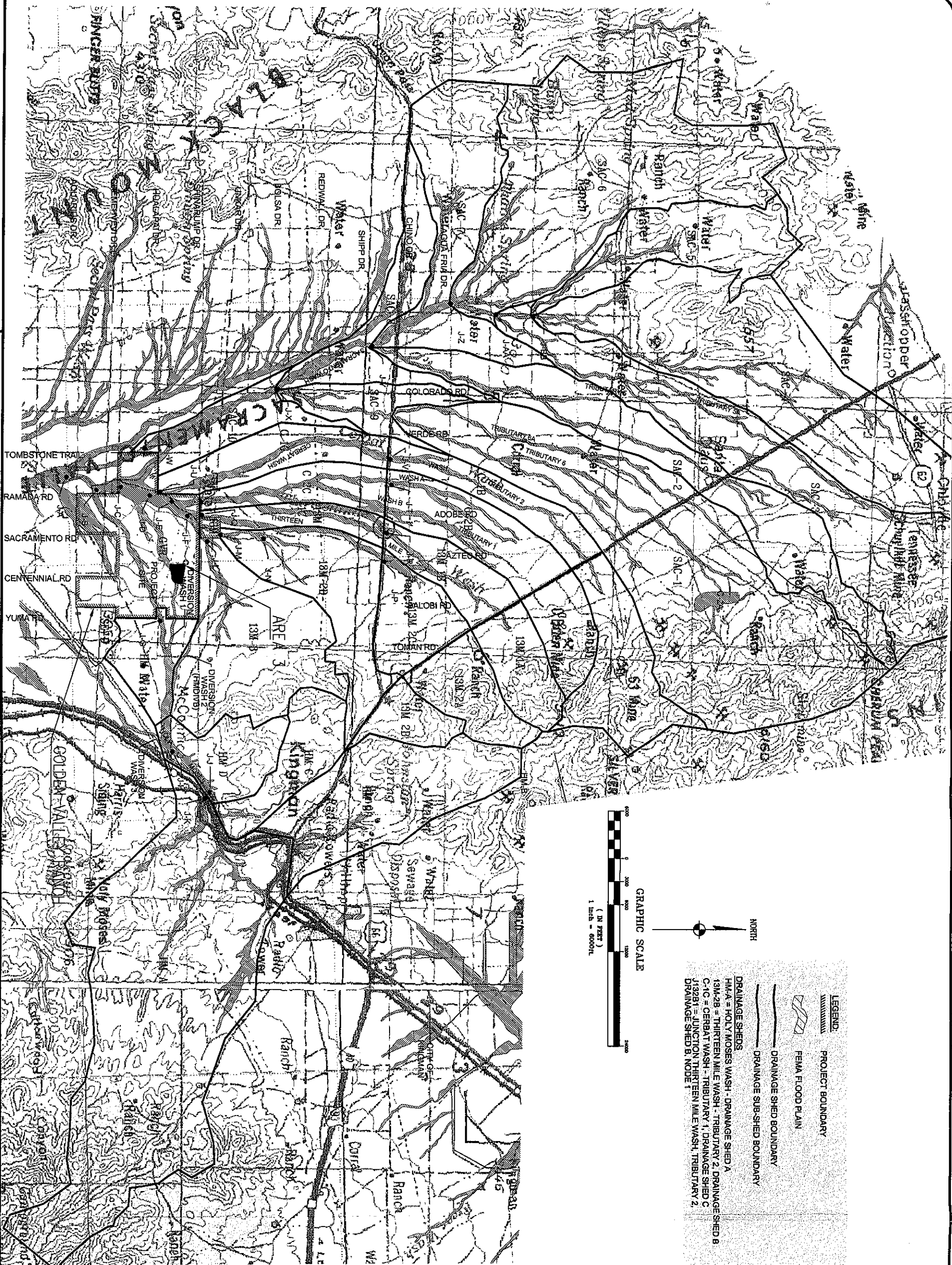
2. SITE DESCRIPTION

2.1. Description of Property

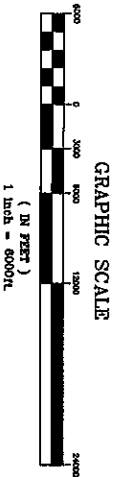
The property is semiarid rangeland with a covering of desert shrub in poor condition. Area 3, is located generally in the southwest quadrant of Sections 2 and 3, Township 20 North, Range 18



Stanley Consultants INC
5620 S. EASTERN AVENUE, SUITE 200
LAS VEGAS, NEVADA 89119 (702) 369-9396



- LEGEND**
- PROJECT BOUNDARY
 - FEMA FLOOD PLAIN
 - DRAINAGE SHED BOUNDARY
 - DRAINAGE SUB-SHED BOUNDARY
- DRAINAGE SHEDS**
- HM-A = HOLY MOSES WASH - DRAINAGE SHED A
 - HM-B = HOLY MOSES WASH - DRAINAGE SHED B
 - HM-C = HOLY MOSES WASH - DRAINAGE SHED C
 - HM-D = HOLY MOSES WASH - DRAINAGE SHED D
 - HM-E = HOLY MOSES WASH - DRAINAGE SHED E
 - HM-F = HOLY MOSES WASH - DRAINAGE SHED F
 - HM-G = HOLY MOSES WASH - DRAINAGE SHED G
 - HM-H = HOLY MOSES WASH - DRAINAGE SHED H
 - HM-I = HOLY MOSES WASH - DRAINAGE SHED I
 - HM-J = HOLY MOSES WASH - DRAINAGE SHED J
 - HM-K = HOLY MOSES WASH - DRAINAGE SHED K
 - HM-L = HOLY MOSES WASH - DRAINAGE SHED L
 - HM-M = HOLY MOSES WASH - DRAINAGE SHED M
 - HM-N = HOLY MOSES WASH - DRAINAGE SHED N
 - HM-O = HOLY MOSES WASH - DRAINAGE SHED O
 - HM-P = HOLY MOSES WASH - DRAINAGE SHED P
 - HM-Q = HOLY MOSES WASH - DRAINAGE SHED Q
 - HM-R = HOLY MOSES WASH - DRAINAGE SHED R
 - HM-S = HOLY MOSES WASH - DRAINAGE SHED S
 - HM-T = HOLY MOSES WASH - DRAINAGE SHED T
 - HM-U = HOLY MOSES WASH - DRAINAGE SHED U
 - HM-V = HOLY MOSES WASH - DRAINAGE SHED V
 - HM-W = HOLY MOSES WASH - DRAINAGE SHED W
 - HM-X = HOLY MOSES WASH - DRAINAGE SHED X
 - HM-Y = HOLY MOSES WASH - DRAINAGE SHED Y
 - HM-Z = HOLY MOSES WASH - DRAINAGE SHED Z

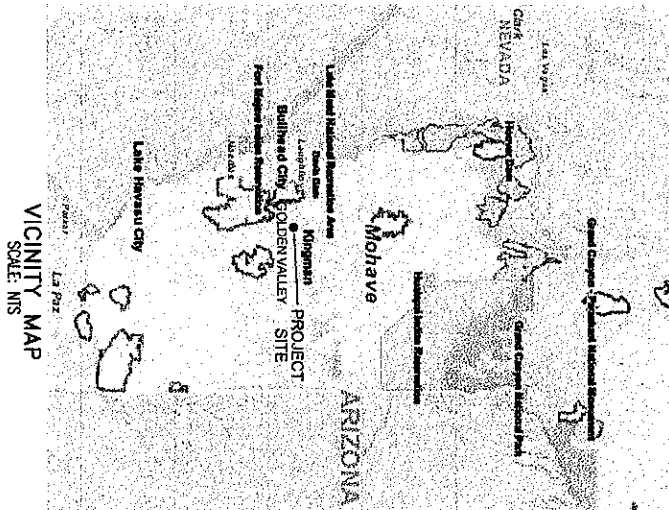


1 inch = 6000 ft

SCALE: NTS

GOLDEN VALLEY RANCH - WASH FLOW SUMMARY

BSIN/NODE	UPSTREAM SITED AREA (SQ. MI.)	FLOW (CFS)	BSIN/NODE	UPSTREAM SITED AREA (SQ. MI.)	FLOW (CFS)
HM-A	36.68	12,887	J-A	289.99	18,556
HM-B	11.68	7,668	J-B	136.79	9,882
HM-C	4.53	3,154	J-C	76.07	9,981
HM-D	4.44	2,042	J-D	67.37	8,281
HM-E	3.40	1,197	J-E	51.13	7,303
HM-F	0.25	242	J-F	38.04	6,457
HM-G	12.08	5,177	J-G	60.72	52.32
HM-H	4.33	3,882	J-H	52.32	14,563
HM-I	2.41	1,540	J-I	15.693	15,693
HM-J	3.05	1,304	J-K	48.36	15,344
HM-K	5.99	1,235	J-L	12.08	5,177
HM-L	3.87	2,319	J-M	15.78	5,177
HM-M	3.56	1,255	J-N	9.76	2,339
HM-N	2.50	660	J-O	7.39	2,101
HM-O	3.31	2,184	J-P	9.83	1,023
HM-P	6.00	1,887	J-Q	7.43	1,321
HM-Q	3.78	964	J-R	13.09	1,016
HM-R	7.12	3,913	J-S	9.31	1,690
HM-S	4.18	1,048	J-T	16.24	1,650
HM-T	4.94	1,035	J-U	11.29	2,452
HM-U	1.05	655	J-V	153.19	14,170
HM-V			J-W	149.13	14,670
HM-X			J-X	106.13	12,436
HM-Y			J-Y	80.89	11,890
HM-Z			J-Z	55.04	9,285
HM-AA			J-AA	33.50	6,188

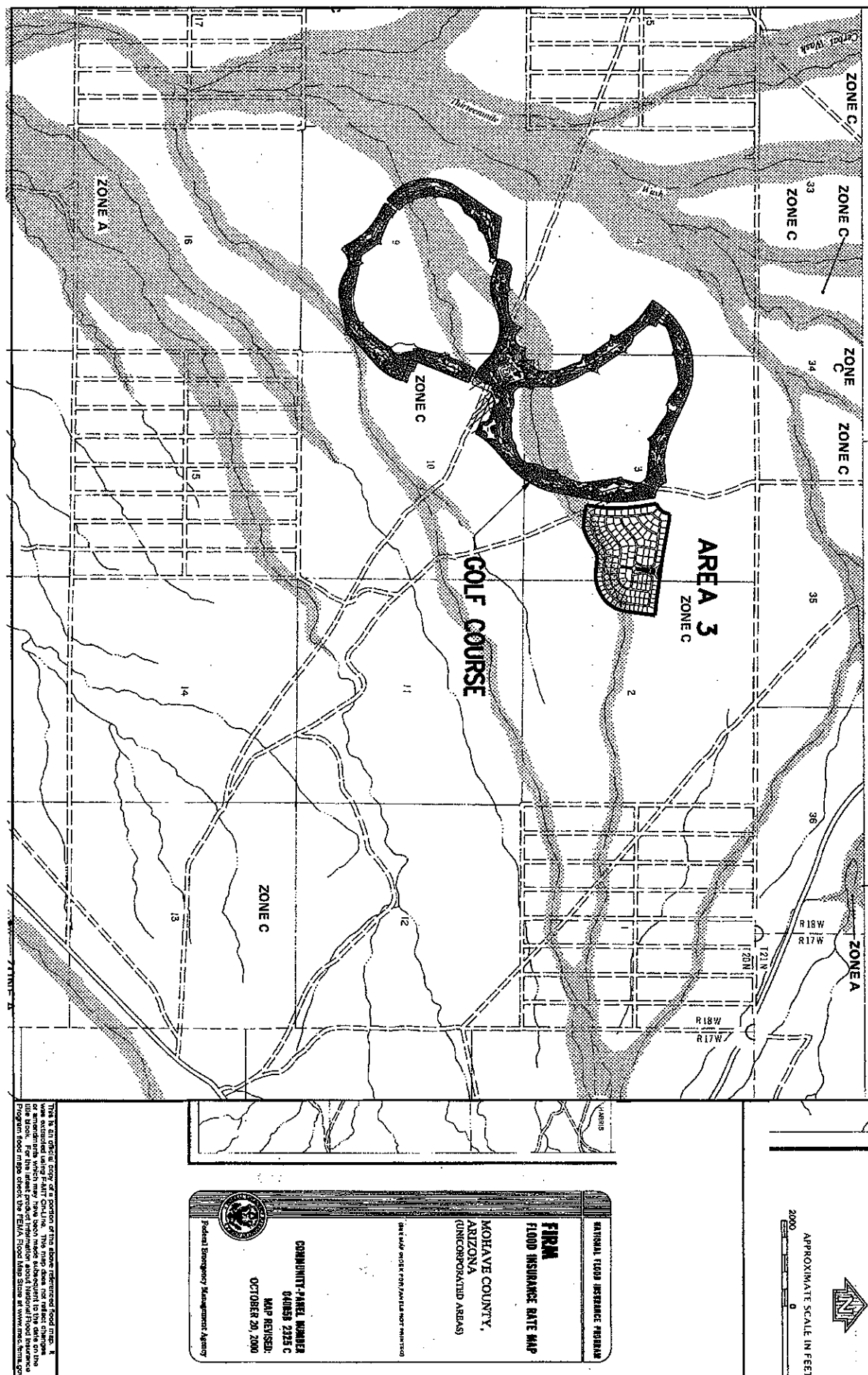


GOLDEN VALLEY SOUTH
VICINITY MAP AND REGIONAL DRAINAGE SCHEME
TECHNICAL DRAINAGE STUDY EXHIBIT

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FIGURE 1



GOLDEN VALLEY RANCH

West, G&SRM. The project will be developed into two residential communities consisting of single-family (12,000 square foot lots, and 6,000 to 7,000 square foot lots) residences, streets, and open spaces.

2.2. Drainage Descriptions

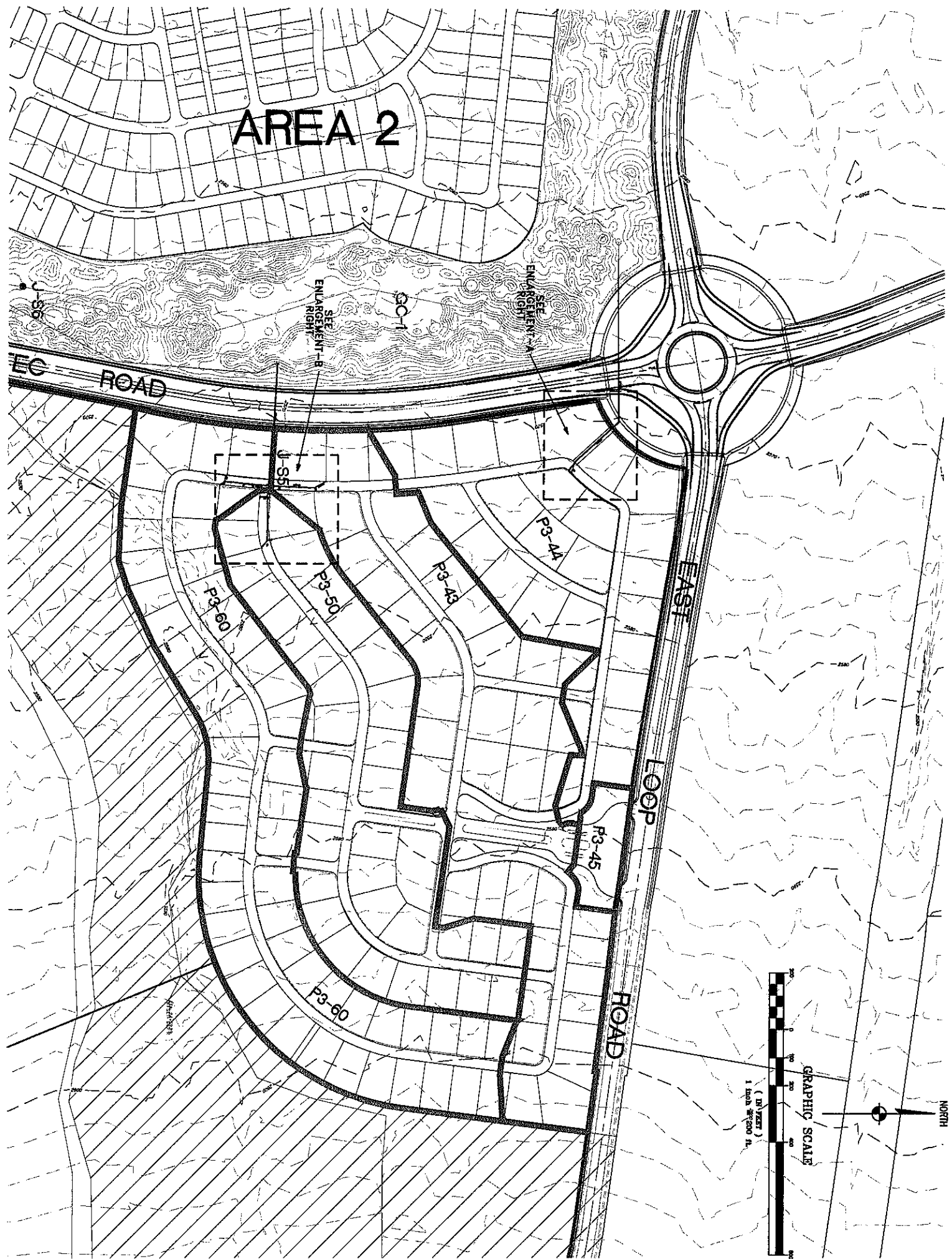
Area 3 is situated between the Thirteen Miles Wash and the Holy Moses Wash. Small braided channels traverse the site and a diversion channel from the Holy Moses Wash (Diversion Wash 1) crosses in a southwesterly direction across the site. The project lies on westerly sloping alluvial fan originating from the Cerbat Mountains.

Rainfall runoff generated within the development travels from the individual residential lot or open space to the street. The street is the main mean of runoff conveyance until runoff exceeds street capacity. When that happens, runoff is received into an underground storm drainage system, into a drainage swale or channel. The storm drainage system is sized to convey a minimum of the 10-yr, 6-hr storm runoff. Runoff generally drains in a westerly direction toward Aztec Road. Area 3 has two release points that collect runoff, conveys it under Aztec Road, and releases it into the adjoining golf course. The storm drainage system is sized to capture the majority of the 100-yr, 6-hr precipitation, with minor amounts of runoff entering the Aztec Road right-of-way. Eventually, all runoff is combined and discharged into the Thirteen Mile Wash, a tributary of the Sacramento Wash.

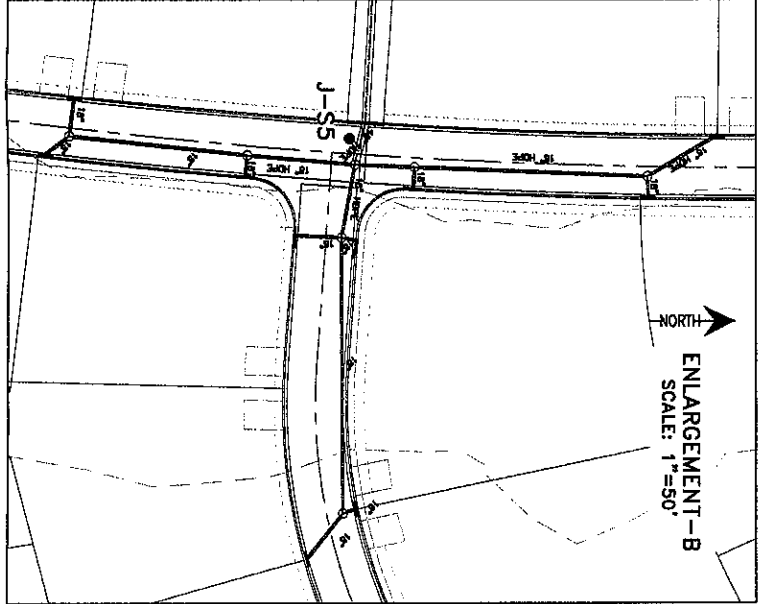
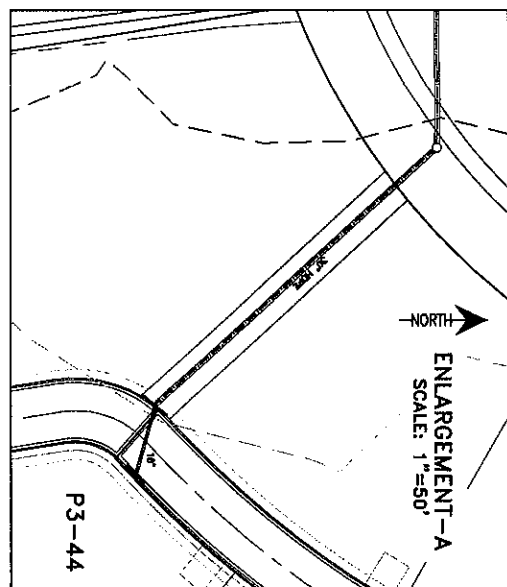
Area 3 is divided into five small sub-sheds, ranging in size from 1.6 acres to 25.4 acres (See Figure 3). Runoff from Shed P3-44 (25 acres) discharges to the north into the golf course where it combines with runoff from Area 2 development and future Areas 62 and 63. A small shed (Shed P3-45) comprises of the Area 3 access from East Loop Road is approximately 1 acre and drains to the north where it combines with the East Loop Road drainage. The remaining 63 acres (P3-43, 50, and 60) combine at junction J-S5. Street flow from the three sub-sheds exceeds the street capacity at the intersection where it is received into a storm drainage system. The majority of flow is carried under Aztec Road and enters the golf course via a bubble-up structure. A small low flow pipe is connected to the golf course drainage system to maintain positive drainage at all times. An overland release is provided for runoff not received into the drainage system at J-S5 and enters Aztec Road.

3. METHODS AND CRITERIA**3.1. Methodology**

The HEC-HMS model was used for the simulation of flood events in watersheds and river basins. This computer model simulates the surface runoff response of a drainage basin to precipitation by representing the basin as an interconnected system of hydrologic and hydraulic components. Each component models an aspect of the rainfall-runoff process within a portion of the whole basin. This basin portion is referred to as a sub-basin. The runoff hydrographs of each sub-basin are then combined and a final discharge hydrograph is obtained. It was chosen as the



- LEGENDS:**
- SHED BOUNDARY
 - SUB-SHED BOUNDARY (P1-99)
 - JUNCTION POINT (J-C9)
 - PROPOSED CHANNEL
 - PROPOSED PIPE
 - STORM DRAIN PIPE
 - STORM DRAIN INLET



Stanley Consultants INC.
5820 S. EASTERN AVENUE, SUITE 200
LAS VEGAS, NEVADA 89119 (702) 369-9396

GOLDEN VALLEY RANCH
AREA 3 DRAINAGE SUB-SHEDS
TECHNICAL DRAINAGE STUDY EXHIBIT

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ARIZONA

FIGURE 3

GOLDEN VALLEY RANCH

hydrology model since it is the model used in a Preliminary Federal Insurance Study prepared for Mohave County Flood Control District, October 2005 for various watersheds in the Golden Valley and Kingman, AZ area. This adds consistency and reliability in the methodology. Modified-Puls routing in the HEC-HMS model allows for retardation of peak flows within the broad flood way of the golf course.

HEC-RAS, another program from the COE, provides a steady state flow analysis to determine water surface elevations within a defined channel or flood plain. Volume computations within the HEC-RAS program were utilized in developing flow routing by Modified-Puls methods.

Water Surface Pressure Gradient (WSPG) program developed by the Los Angeles County Flood Control District. WSPG is a similar program to HEC-RAS in that it develops the water surface elevations and other channel parameters, but is better adapted to closed (pressure) conduit flow and is therefore used in the evaluation of the stormwater infrastructure system.

Calculations for street capacity are produced using the FlowMaster by Haestad Methods, Inc. Inlet calculations are performed using Federal Highway Administration's Visual Urban program for pavement drainage.

3.2. Drainage Shed and Modeling Convention

The basic naming convention of the basins for the exhibits and model are based around the individual drainage shed of the development. Sheds are labeled as P3-44, identifying Area 3, Shed 44. Junction points or points of runoff confluence are identified as J-S5, identifying that it is a junction point and a label. An R designates a routing of a shed or junction, therefore R-JS5 represents routing of junction J-S5 to another point.

3.3. Design Storm and Precipitation

Local jurisdiction requires that water sheds less than 20 square miles be evaluated for the 6-hour local storm. Drainage sheds of 20 to 100 square miles are to be evaluated for both the 6-hour and 24-hour rainfall events. Areas from 20 square miles to 500 square miles are considered general storms and are evaluated for the 24-hour precipitation.

Maricopa County Flood Control District has developed storm distribution curves associated with drainage shed size. Since the total area of Area 3, is less than 1 square mile, Pattern 1 of the Maricopa County 6-Hour Mass Curve was utilized for the storm distribution. Precipitation values of 3.00-inches and 1.76-inches were taken from the National Oceanographic and Atmospheric Administration National Weather Service's Atlas 14. Table 1 provides the precipitation values from NOAA Atlas 14. Since the total area of Area 3 is 0.14 square miles (90 acres) the depth-area reduction factor was not applied.

GOLDEN VALLEY RANCH**Table 1 - Precipitation**

Recurrence Interval (yrs)	5 min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr
10-yr	0.40	0.61	0.75	1.01	1.25	1.44	1.53	1.76
100-yr	0.65	0.98	1.22	1.64	2.03	2.44	2.67	3.00

3.4. Soils

Soils information is taken from the Natural Resources Conservation Service, Soil Data Mart. Soils within Area 1, Phases A & B consist of CACIQUE-BUCKLEBAR-ALKO (AZ039) type. These soils have a hydrologic soil type designation of "C".

3.5. Model Data and Results

Table 2 summarizes runoff at junction points and drainage sheds within Area 3. Runoff values are rounded to the nearest 1 cfs.

Table 2 –Flow Summary

Element	Area (sq mi)	Peak Discharge 100-yr (cfs)	Peak Discharge 10-yr (cfs)
J-S5	0.1092	187	64
P3-43	0.0393	60	16
P3-44	0.0281	38	10
P3-45	0.0025	5	1
P3-50	0.0303	59	22
P3-60	0.0396	71	26

It should be noted that the precipitation depths of the 100-yr, 6-hr event is 3-inches and that the precipitation depth of the 10-yr, 6-hr storm is 1.53-inches. The 100-yr precipitation is nearly twice for the 10-yr event. For the same events the amount of excess precipitation available for runoff is dependent on the runoff curve number, which is a function of soil type, land use, and antecedent moisture conditions. For this reason a larger portion of the 100-yr precipitation is available for runoff than for the smaller 10-yr storm and the ratio of peak runoff for the 100-yr precipitation to 10-yr precipitations is nearly 3.

All model results and input data are found in the Appendices of this study. They consist of the following:

- Appendix A – Model Results and Data provides the input parameters and results for Area 3, sheds.
- Appendix B – Drainage Infrastructure provides the storm drain inlet calculations open channel flow calculations through utility easements.
- Appendix C – Street Capacity Calculations
- Appendix D – Public Right-of-Way Drainage Improvements

GOLDEN VALLEY RANCH**4. Drainage Improvements within the Public Right-of-Way**

Access to the project site is via Shinarump Road from the north to the new Aztec Road alignment and the East Loop Road. No improvements are anticipated between the Area 3 entrance and the intersection with Aztec Road.

Aztec Road will receive a culvert crossing at the Power line Easement to convey runoff from off-site areas to the Thirteen Mile Wash. The West Loop Road, west of Area 3 will have a pipe crossing from the Open Space area of Area 1, Phase 1 and convey this and other Area 1, Phases 1 & 2 runoff south, crossing a future portion of the West Loop Road and discharging into the golf course (See Figure 4). Discharge from Area 1, Phases A & B drainage sheds are discussed in Section 2.2 of the Drainage Study of Area 1, Phases A & B.

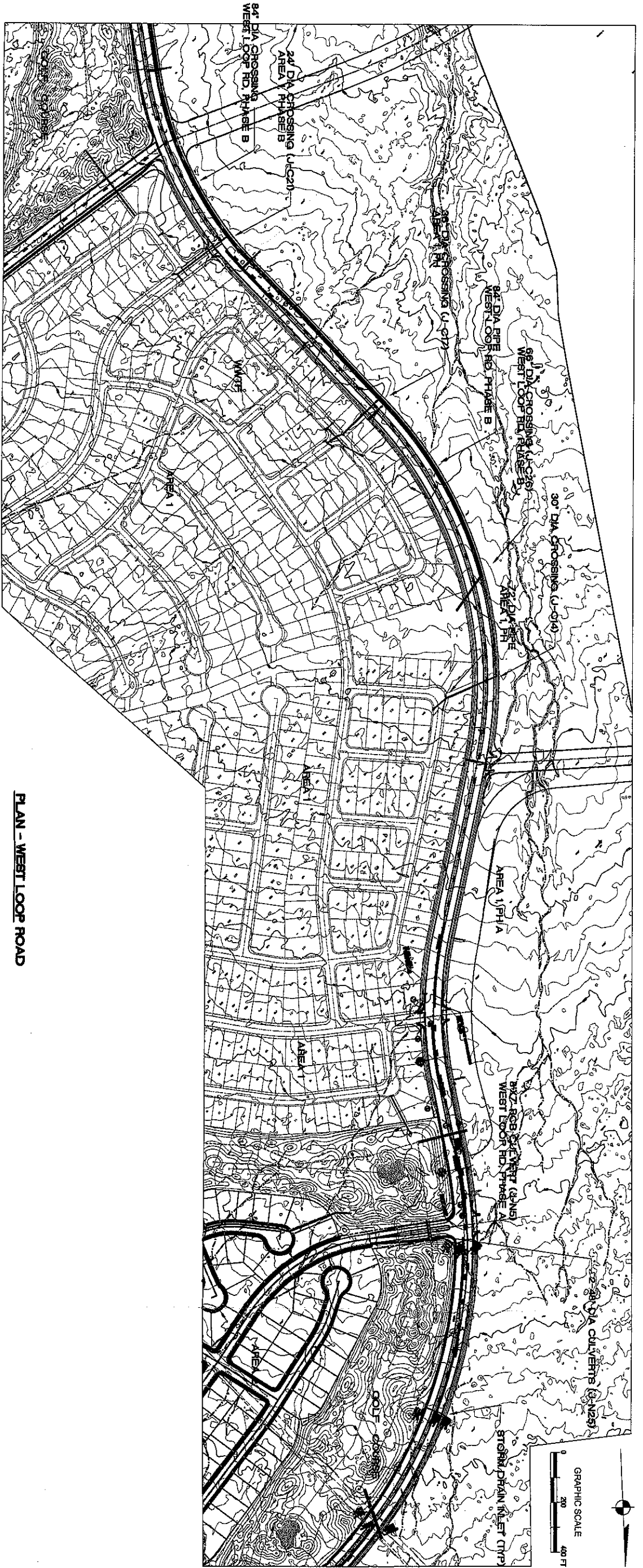
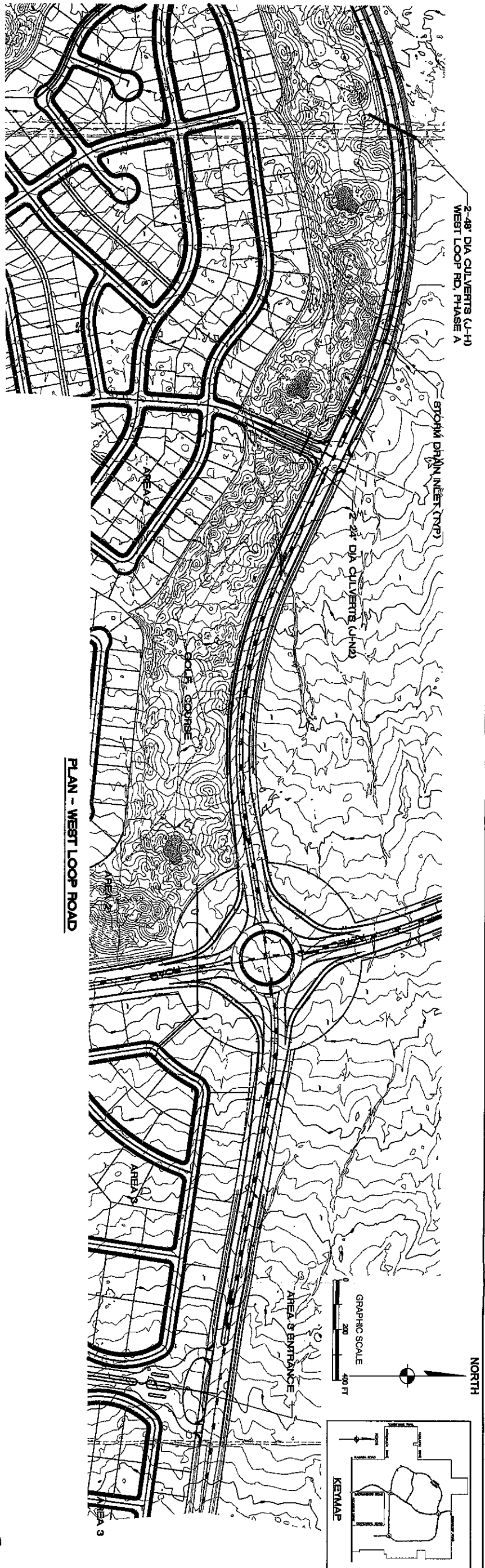
Appendix D contains street capacity calculations for the arterial roads and inlet capacity calculations.

5. Comparison of Flows

The drainage shed characteristics change with development of existing lands. The pervious soils that formerly existed become less pervious with the addition of houses, streets, and sidewalks and the time for runoff to reach its release point shortens. From a drainage point of view, one of the major advantages to the adjacent golf course is that drainage runoff is routed through its fairway system. This not only allows for runoff of the major storm events, but also allows for the golf course to absorb some for the runoff volume, therefore reducing the peak flow. Figure 5 shows existing drainage as it relates to the Area 1-3 development and outside areas that will drain through the proposed system. Table 3 provides a comparison of existing flows to developed flow at major junction points. Note that runoff from the northern release point J-N5 exceeds its existing flow into the Thirteen Mile Wash, the collective flows from J-N5 and J-S26 less than existing due to detention provided within the golf course.

Table 3 – Flow Comparison

Shed	Area (acres)	Indirect Methods (cfs)	HEC- HMS (cfs)
J-H	73.26	191	211
J3-44	18.12	73	38
J-S5	69.79	184	187
J-S9	439.35	657	456
J-N5	369.78	582	621
J-S26	713.82	916	798



PLAN - WEST LOOP ROAD

PLAN - WEST LOOP ROAD

SHEET
FIGURE 4
6 OF 40 SHEETS
18449.03.05

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GOLDEN VALLEY RANCH

WEST LOOP ROAD
STORM DRAIN IMPROVEMENTS

MOHAVE COUNTY

ARIZONA



Stanley Consultants INC.

5820 S. Eastern Avenue, Suite 200
Las Vegas, Nevada 89119
(702) 369-9799 Fax (702) 369-9793
www.stanleygroup.com

SCALE (H) 1"=200'

SCALE (V)

DRAWN BY VND

CHECKED BY MPB

DATE 8/30/05

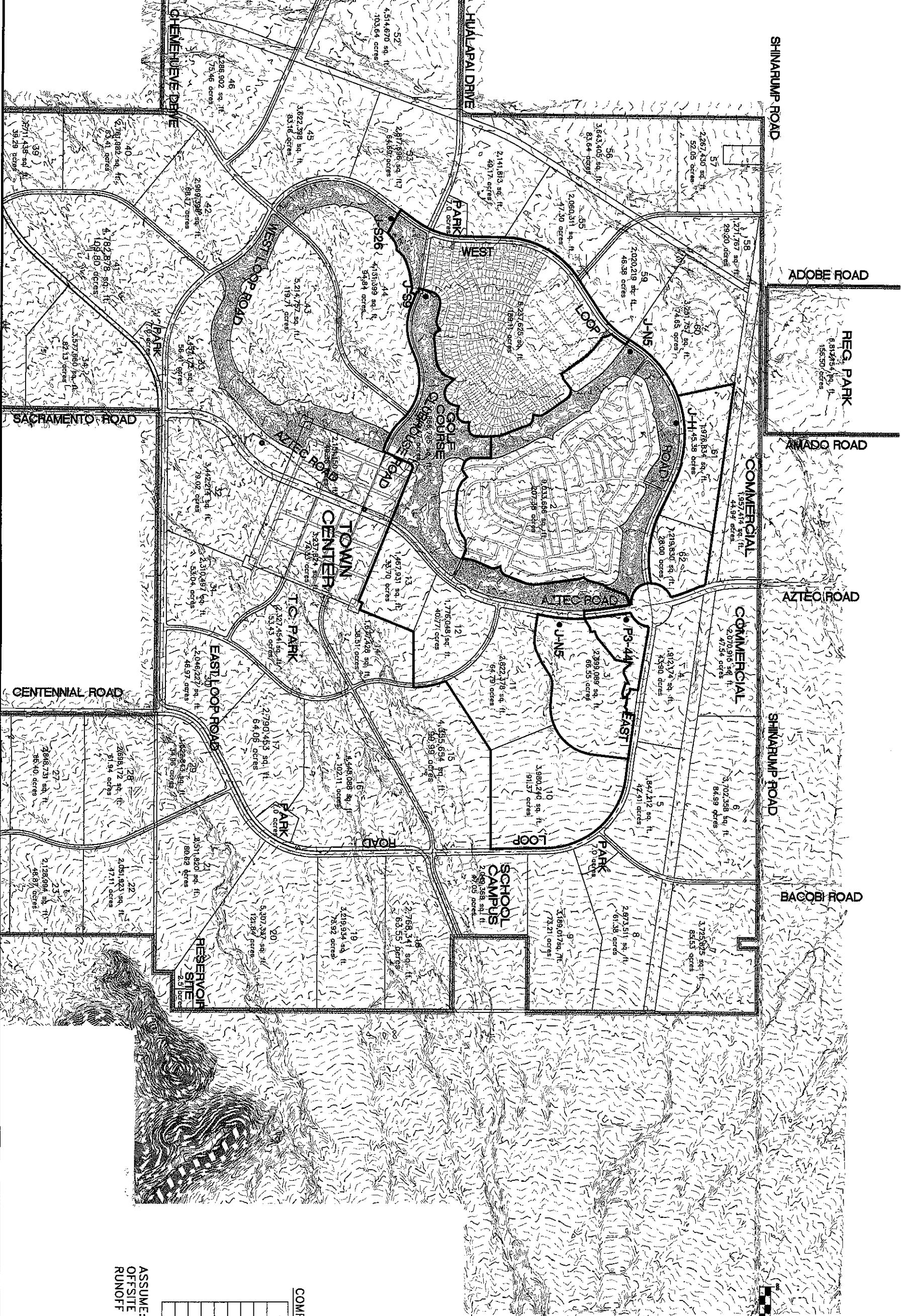
NO.	DESCRIPTION	DESIGNED BY	CHECKED BY	DATE

ST-RH036642

Q:\18449\dwg\design\Figure 5 - Existing Local Site Drainage.dwg, 8/22/2006 2:35:33 PM, \\vg-ps1\hp5500-cm-pcl, 1:2.12868



Stanley Consultants INC.
5820 S. EASTERN AVENUE, SUITE 200
LAS VEGAS, NEVADA 89119 (702) 369-9396



COMPARISON OF FLOW

SHED/JUNCTION	EXISTING FLOWS	DEVELOPED FLOWS
P3-44	73	38
J-S5	184	187
J-S9	656	456
J-H	191	211
J-W5	582	621
J-S26	916	796

ASSUME: PROPOSED LOOP ROADS DIVERT
OFFSITE RUNOFF AWAY FROM PROJECT
RUNOFF = (100 YRS. 6 HRS.)

GOLDEN VALLEY RANCH
EXISTING DRAINAGE AND PROPOSED OFFSITE IMPROVEMENTS
TECHNICAL DRAINAGE STUDY EXHIBIT

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FIGURE 5

GOLDEN VALLEY RANCH**6. FEMA Base Flood Elevations**

The Holy Moses Diversion Wash #1 leaves the main channel east of the site. It travels in a westerly direction along the westerly sloping alluvial fan. The runoff generally remains within the washes banks, but as it reaches the channel edge it spills over into the surrounding dessert plain. Overtime the cresting and release of flow along with its sediment load has formed a channel with overbanks sloping away from the channel.

A HEC-RAS analysis provides the Base Flood Elevations (BFE) for this diversion wash. The base flood flow within Holy Moses Diversion Wash # 1 is based on derived flow from the Technical Drainage Study for Golden Valley Ranch, Mohave, Arizona, dated October 2005. Finish building grades are developed to remain 1 foot to 1.5 feet above the BFE. Figure 6 shows the BFE's for development in Areas 1-3.

7. SUMMARY

This study develops specific criteria and flow for the development of Area 1, Phases A & B.

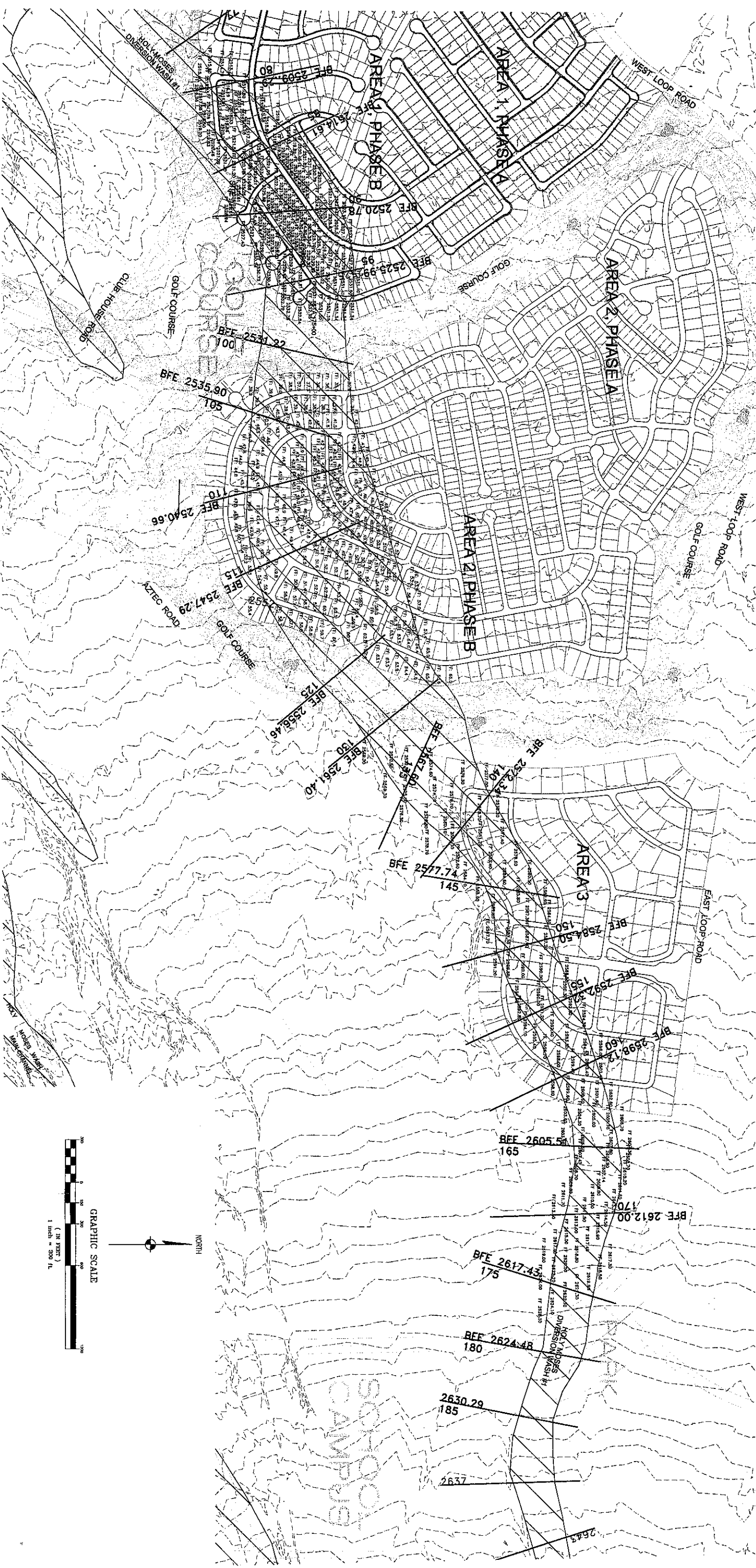
- The majority of the development runoff can be maintained and conveyed within the street right-of-way. Where street flow capacity is reached, a storm drainage system is required.
- The drainage infrastructure is capable of conveying the 10-yr, 6-hr storm event (minimum).
- The adjacent golf course services as runoff conveyance and storage.
- Total discharge from the collective Areas 1-3 to the Thirteen Mile Wash is less because of the use of runoff volume storage provided in the golf course.
- Conveyance of stormwater runoff within the golf course fairways allows for some ground water recharge.

8. REFERENCES

- 1) *Flood Insurance Rate Map*, Community Panel Number 040058 2325 C, Mohave County, Arizona, effective October 20, 2002.
- 2) *Highway Drainage Design Manual*, Arizona Department of Transportation, Report Number FHWA-AZ93-281, Final Report, March, 1993
- 3) *Drainage Design Manual for Maricopa County, Arizona*, Hydrology: Rainfall, Flood Control District of Maricopa County, November 2003



Stanley Consultants Inc.
5820 S. EASTERN AVENUE, SUITE 200
LAS VEGAS, NEVADA 89119 (702) 369-9396



LEGEND
FEMA FLOOD PLAIN
BFE 2598.12
CROSS SECTION (HEC-RAS MODEL)

GRAPHIC SCALE
(IN FEET)
1 inch = 500 ft

NORTH

GOLDEN VALLEY RANCH
HOLY MOSES DIVERSION WASH #1 (BASE FLOOD ELEVATIONS)
TECHNICAL DRAINAGE STUDY EXHIBIT

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FIGURE 6

GOLDEN VALLEY RANCH

APPENDIX A

AREA 3 – RESULTS AND DATA

- **HEC-HMS 100-YR, 6-HR SIMULATION**
- **HEC-HMS 10-YR, 6-HR SIMULATION**
- **NOAA ATLAS 14 PRECIPITATION**
- **STANDARD FORM 4**

Project: Pod3_S-curve Simulation Run: Pod3 100-yr

Start of Run: 01Jan3000, 01:00 Basin Model: Pod 3
 End of Run: 02Jan3000, 01:55 Meteorologic Model: S-Pattern 1(3.00in)
 Execution Time: 15Mar2006, 10:34:21 Control Specifications: Control 1

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
J-S5	0.1092	187.25	01Jan3000, 05:15	10.27
P3-43	0.0393	60.15	01Jan3000, 05:10	2.88
P3-44	0.0281	37.59	01Jan3000, 05:15	2.06
P3-45	0.0025	4.59	01Jan3000, 05:05	0.18
P3-50	0.0303	59.14	01Jan3000, 05:15	3.20
P3-60	0.0396	70.55	01Jan3000, 05:15	4.18

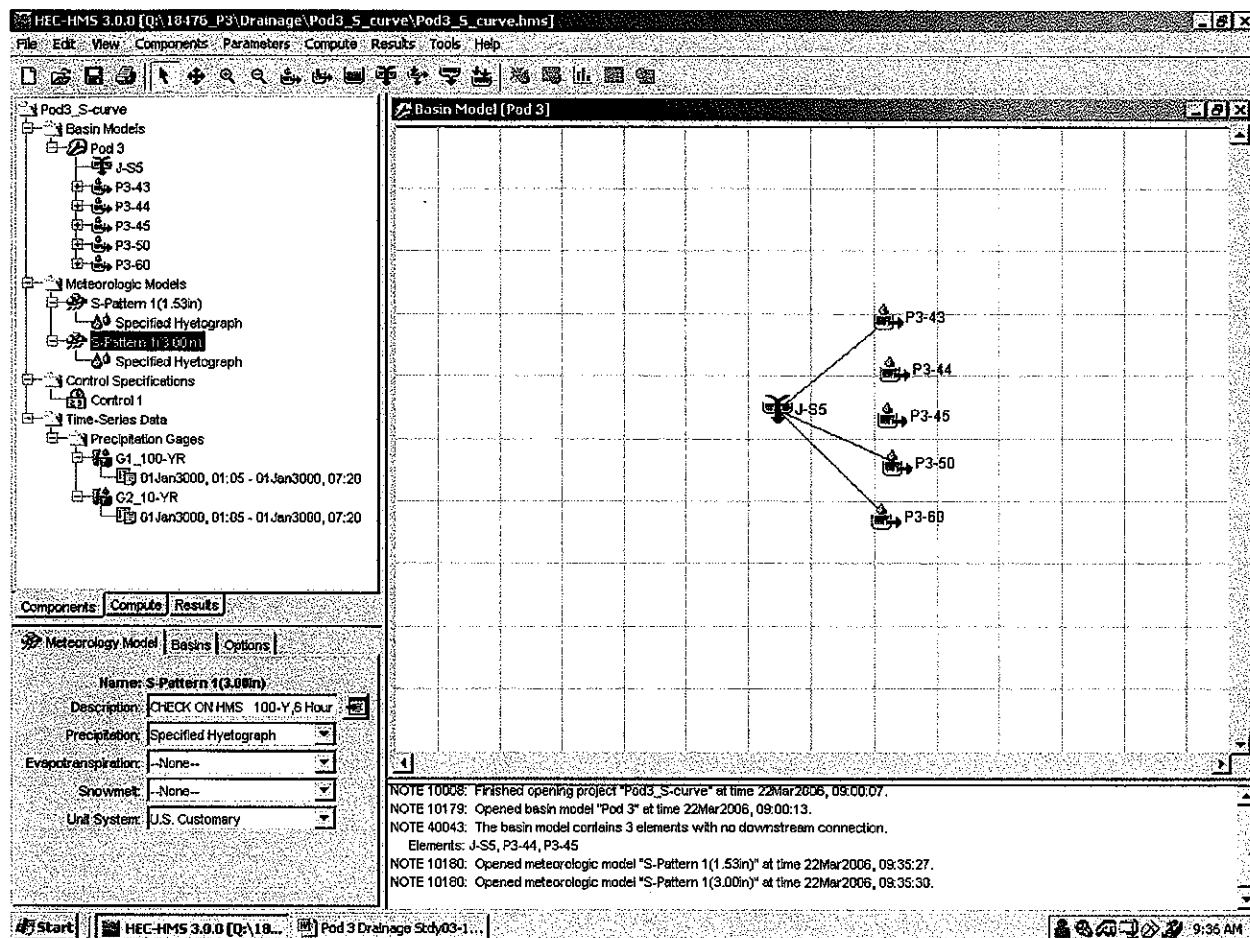
Project: Pod3_S-curve Simulation Run: Pod3 10yr

Start of Run: 01Jan3000, 01:00 Basin Model: Pod 3
 End of Run: 02Jan3000, 01:55 Meteorologic Model: S-Pattern 1(1.53in)
 Execution Time: 15Mar2006, 10:34:47 Control Specifications: Control 1

Volume Units: AC-FT

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
J-S5	0.1092	64.13	01Jan3000, 05:15	3.40
P3-43	0.0393	15.90	01Jan3000, 05:15	0.76
P3-44	0.0281	9.68	01Jan3000, 05:15	0.54
P3-45	0.0025	1.28	01Jan3000, 05:10	0.05
P3-50	0.0303	22.34	01Jan3000, 05:15	1.14
P3-60	0.0396	25.89	01Jan3000, 05:15	1.49

GOLDEN VALLEY RANCH



Precipitation

Time	100-yr, 6-hr	10-yr, 6-hr
01Jan3000, 01:05	0	0
01Jan3000, 01:20	0.024	0.012
01Jan3000, 01:35	0.048	0.024
01Jan3000, 01:50	0.075	0.038
01Jan3000, 02:05	0.099	0.05
01Jan3000, 02:20	0.123	0.063
01Jan3000, 02:35	0.15	0.077
01Jan3000, 02:50	0.174	0.089
01Jan3000, 03:05	0.198	0.101
01Jan3000, 03:20	0.222	0.113
01Jan3000, 03:35	0.261	0.133
01Jan3000, 03:50	0.297	0.151
01Jan3000, 04:05	0.354	0.181
01Jan3000, 04:20	0.414	0.211
01Jan3000, 04:35	0.648	0.33
01Jan3000, 04:50	1.131	0.577
01Jan3000, 05:05	2.502	1.276
01Jan3000, 05:20	2.733	1.394
01Jan3000, 05:35	2.793	1.424
01Jan3000, 05:50	2.85	1.454
01Jan3000, 06:05	2.886	1.472
01Jan3000, 06:20	2.916	1.487
01Jan3000, 06:35	2.949	1.504
01Jan3000, 06:50	2.973	1.516
01Jan3000, 07:05	3	1.53

StandardForm4

Project: 6-Hour Design Storm Distribution Stanley Consultants Inc 5820 S. Eastern Ave, Suite 200 Las Vegas, Nevada 89119 702.389.9396		Project: 0 Job No.: 0 Date: 0 Calculated by: 0		Modified STANDARD FORM 4 from the Clark County Regional Flood Control District's Hydrologic Criteria and Drainage Design Manual Stanley Consultants Inc 5820 S. Eastern Ave, Suite 200 Las Vegas, Nevada 89119 702.389.9396	
SCS Curve Numbers Curve Numbers		Sub-Basin Data			
Drainage Basin Name (Acres) (Sq. Mi.) Drainage Area (Acres) (Sq. Mi.) Tbl. 602 Paragraph No.		Initial/Overland Time (T_i) Length (feet) Slope (%) T _i (min)			
EXISTING CONDITIONS P3-43 25.16 0.0383 P3-44 18.01 0.0281 P3-45 1.83 0.0025 P3-50 19.30 0.0303 P3-60 25.38 0.0386		Travel Time (T_t) Length (feet) Slope (%) V ₁ (FPS) V ₂ (FPS) T _t (min)			
Drainage Basin Name (Acres) (Sq. Mi.) Tbl. 602 Paragraph No.		To Check Total Length (feet) T _c (min) T _i +T _c (min) T _c (min) T _i +T _c (min)			
EXISTING CONDITIONS P3-43 25.16 0.0383 P3-44 18.01 0.0281 P3-45 1.83 0.0025 P3-50 19.30 0.0303 P3-60 25.38 0.0386		Final T_c T _c (min) T _i +T _c (min) T _c (min) T _i +T _c (min)			
Drainage Basin Name (Acres) (Sq. Mi.) Tbl. 602 Paragraph No.		HEC-IMP-UT Drainage Area (Sq. Mi.) T _c =5 for Urban			
Drainage Basin Name (Acres) (Sq. Mi.) Tbl. 602 Paragraph No.		Remarks			

URBAN AREAS Notes: 1.01 Open space - poor 1.02 Open space - fair 1.03 Open spaces - good 1.04 Paved (includes right-of-way) 1.05 Paved curbs and storm drains 1.06 Paved open ditches (includes ROW) 1.07 Gravel (includes ROW) 1.08 Dirt (includes ROW) 1.11 Commercial & Business 1.12 Industrial 1.13 Apartments/Condos 1.14 Townhouses - 6000 sq. ft. 1.15 7000 sq. ft. lots 1.16 8000 sq. ft. lots 1.17 10,000 sq. ft. lots 1.18 14,000 sq. ft. lots 1.19 20,000 sq. ft. lots 1.20 40,000 sq. ft. lots 1.21 80,000 sq. ft. lots		Generalized Manning's Equations Existing Conditions V ₁ = 14.8/(S ^{1/3}) V ₂ = 28.4/(S ^{1/3}) Developed Conditions V ₁ = 20.2/(S ^{1/3}) V ₂ = 30.8/(S ^{1/3})	
68	79	86	88
49	69	79	84
39	61	74	80
88	98	98	98
88	88	88	88
83	69	82	83
76	85	89	81
72	82	87	88
89	82	94	85
81	88	91	83
81	88	91	83
80	87	90	82
76	84	89	91
73	82	88	80
61	75	83	87
57	72	81	86
54	70	80	85
51	68	79	84
46	65	77	82

18476-Pol 3
 HEC-HMS DATA RESULTS
 C:\18476_P3\Drainage\Drainage Study\18476P3SUForm4.xls

ST-RH036651

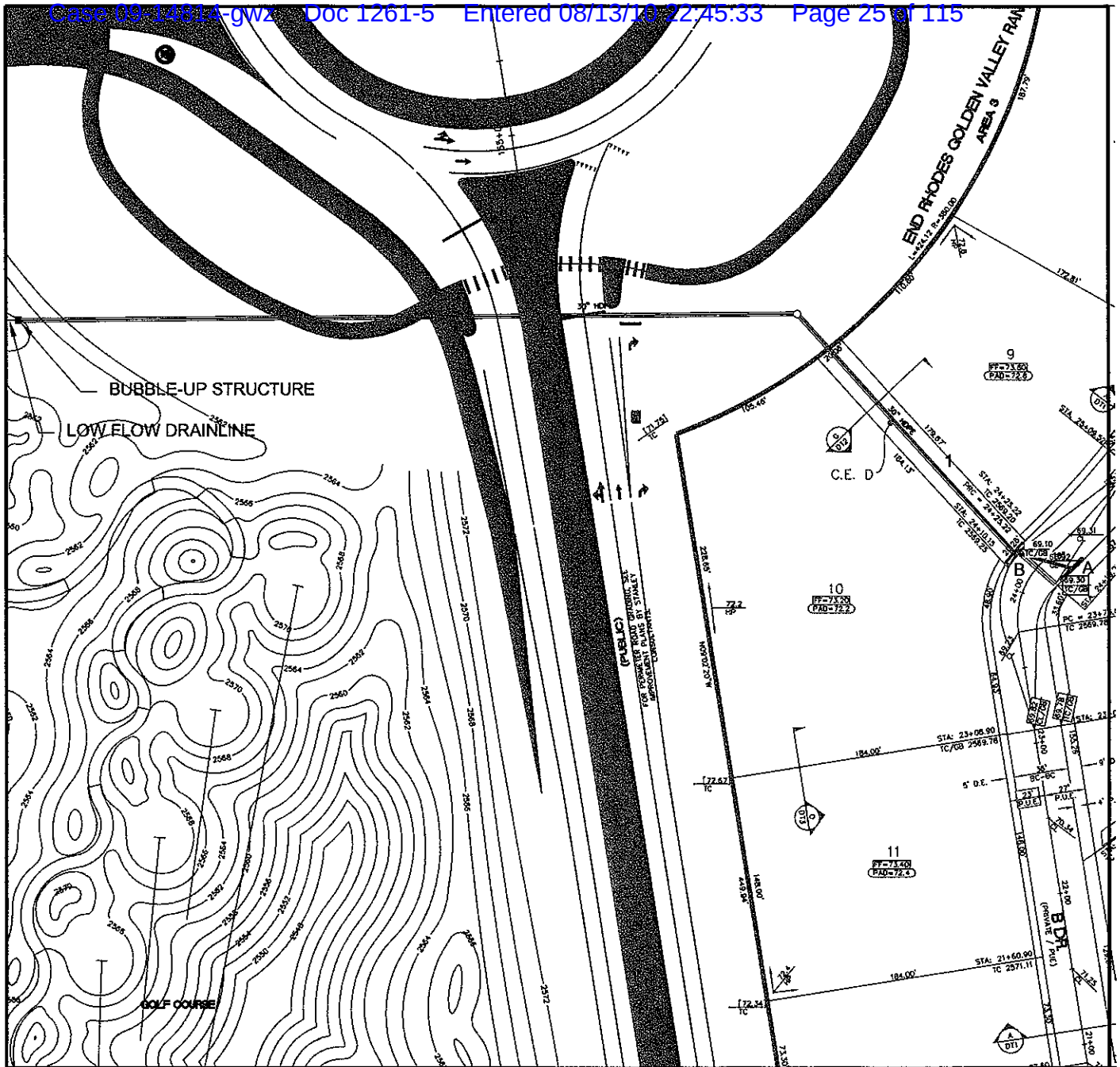
GOLDEN VALLEY RANCH

APPENDIX B

DRAINAGE INFRASTRUCTURE CALCULATIONS

- **COMMON EASEMENT (P3-44)**
- **COMMON EASEMENT (J-N5)**





STORM DRAIN SYSTEM

INLET	SIZE	Q _{inlet}	Q _{intercept}	Q _{bypass}	Grade/Sump
A	14.5	19	11	8	G
B	17.5	27	15	12	S

SD PIPES

PIPE	Q _{pipe}	Size
1	26	30

BUBBLE-UP STR

PIPE	Type	Open Area
30	Type F	2.5 x 3.5

REVISIONS	DWN	APVD	APVD	DATE
DESIGNED RJM				
DRAWN RJM				
CHECKED				
APPROVED				
APPROVED				
DATE 3/02/06				



RHODES HOMES ARIZONA
GOLDEN VALLEY RANCH
AREA 3 - PHASE A

COMMON EASEMENT D
SHED P3-44

SCALE 1" = 100'	
NO.	REV.
A	0

STANLEY CONSULTANTS
CADD A1-R3

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Grade
Date: 03/15/2006Project No. :18476-Pod 3
Project Name.:Golden Valley Ranch - Pod 1
Computed by :rjm

Project Description

COMMON EASEMENT D
SHED P3-44
INLET A

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0099
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	19.000
T	Width of Spread (ft)	21.50

Gutter Flow

Eo	Gutter Flow Ratio	0.204
d	Depth of Flow (ft)	0.53
V	Average Velocity (ft/sec)	4.05

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	35.07	7.25	0.07	1.315	17.685
Parallel Bar P-1-7/8	1.50	5.88	0.52	9.231	8.454
Combination			0.56	10.546	8.454

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Sag
Date: 03/10/2006Project No. :18449
Project Name.:GOLDEN VALLEY RANCH
Computed by :rjmProject Description
SAG INLETS - ALL PODS
MODIFIED "C" L-17.5
INLET B

Inlets on Sag: Sweeper Combination Inlet

Roadway and Discharge Data

	Cross Slope	Composite/Dep
Sx	Pavement Cross Slope (ft/ft)	0.0100
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00

Inlet Interception

	Inlet Type *Sag*	Curb-Opening
L	Curb-Opening Length (ft)	8.75
H	Curb-Opening Height (in)	6.00
	Inlet Type *Sag*	Parallel Bar P-1-7/8
T	Width of Spread (ft)	39.00
WGR	Grate Width (ft)	1.50
L	Grate Length (ft)	7.38
	Inlet Type *Sag*	Sweeper Combination
d_ave	Depth of Flow (ft)	0.521
d_curb	Depth at Curb (ft)	0.667
Qi	Intercepted Flow (cfs)	15.000

Note: The curb opening length in the input screen is the total of the curb opening including its length along the grate.

Worksheet**Worksheet for Triangular Channel**

Project Description	
Worksheet	CE-D Drainage Easement - Triangular
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.020
Channel Slope	0.005000 ft/ft
Left Side Slope	28.80 H : V
Right Side Slope	28.80 H : V
Discharge	12.00 cfs

Results	
Depth	0.46 ft
Flow Area	6.1 ft ²
Wetted Perimeter	26.50 ft
Top Width	26.48 ft
Critical Depth	0.40 ft
Critical Slope	0.009941 ft/ft
Velocity	1.97 ft/s
Velocity Head	0.06 ft
Specific Energy	0.52 ft
Froude Number	0.72
Flow Type	Subcritical

VELOCITY X DEPTH

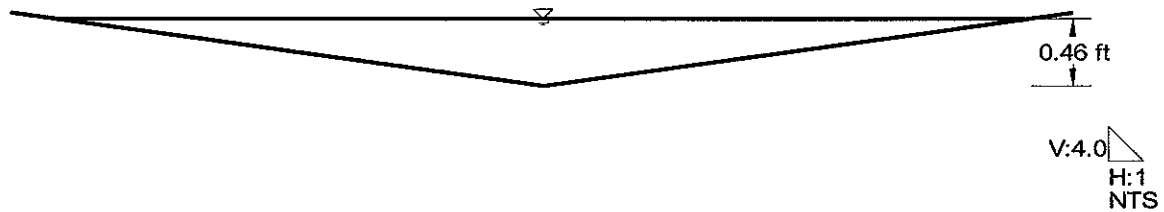
$$2.0 \times 0.5 = 1.0 < 6.0$$

Cross Section

Cross Section for Triangular Channel

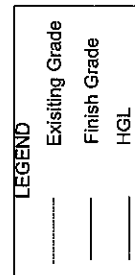
Project Description	
Worksheet	CE-D Drainage Easement - Triangular
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.020
Channel Slope	0.005000 ft/ft
Depth	0.46 ft
Left Side Slope	28.80 H : V
Right Side Slope	28.80 H : V
Discharge	12.00 cfs



[illegible]

CADD A1-R3 © STANLEY CONSULTANTS



ST-RH036658

F O S I S P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

GOLDEN VALLEY RANCH

HEADING LINE NO 2 IS -

GOLDEN VALLEY

HEADING LINE NO 3 IS -

LATERAL ON SOUTH SIDE for JS 5 in POD 3

ST-RH036659

DATE: 3/15/2006
TIME: 13:51

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD	SECT	CHN	NO OF	AVE PIER	HEIGHT 1	BASE	ZL	ZR	INV	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CODE	NO	TYPE	PIERS	WIDTH	DIAMETER	WIDTH			DROP										
CD	24	4			2.00														
CD	36	4			3.00														
CD	18	4			1.50														

LICENSEE: STANLEY CONSULTANTS, INC.

F0515P

PAGE 1

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH
GOLDEN VALLEY
LATERAL ON SOUTH SIDE

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.E.L.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
100.00	2561.24	5.610	2566.850	33.0	4.67	0.338	2567.188	0.00	1.865	3.00	0.00	0.00	0	0.00
60.00	0.02000					.002448	0.15		1.224			0.00		
160.00	2562.44	4.557	2566.997	33.0	4.67	0.338	2567.335	0.00	1.865	3.00	0.00	0.00	0	0.00
JUNCT STR	0.02000					.001630	0.01					0.00		
165.00	2562.54	4.918	2567.458	19.0	2.69	0.112	2567.570	0.00	1.397	3.00	0.00	0.00	0	0.00
95.00	0.02000					.000811	0.08		0.912			0.00		
260.00	2564.44	3.095	2567.535	19.0	2.69	0.112	2567.647	0.00	1.397	3.00	0.00	0.00	0	0.00

ST-RH036662

GOLDEN VALLEY RANCH
GOLDEN VALLEY
LATERAL ON SOUTH SIDE

100.00	.	I			C		H				W	E		R
103.27	.													
106.53	.													
109.80	.													
113.06	.													
116.33	.													
119.59	.													
122.86	.													
126.12	.													
129.39	.													
132.65	.													
135.92	.													
139.18	.													
142.45	.													
145.71	.													
148.98	.													
152.24	.													
155.51	.													
158.78	.													
162.04	.		I				C		H		W	E		JX
165.31	.		I			C		H				WE		R
168.57	.													
171.84	.													
175.10	.													
178.37	.													
181.63	.													
184.90	.													
188.16	.													
191.43	.													
194.69	.													
197.96	.													
201.22	.													
204.49	.													
207.76	.													
211.02	.													
214.29	.													
217.55	.													
220.82	.													
224.08	.													
227.35	.													
230.61	.													
233.88	.													
237.14	.													
240.41	.													
243.67	.													
246.94	.													
250.20	.													
253.47	.													
256.73	.													
260.00	.					I			C			H WE		R
	.													
		2561.24	2561.88	2562.52	2563.16	2563.80	2564.44	2565.08	2565.72	2566.36	2567.01	2567.65		

NOTES

1. GLOSSARY

I = INVERT ELEVATION
C = CRITICAL DEPTH
W = WATER SURFACE ELEVATION
H = HEIGHT OF CHANNEL
E = ENERGY GRADE LINE
X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Grade
Date: 03/15/2006Project No. :18476-Pod 3
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT E
NODE J-5
INLET A

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0050
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	30.000
T	Width of Spread (ft)	29.26

Gutter Flow

Eo	Gutter Flow Ratio	0.147
d	Depth of Flow (ft)	0.68
V	Average Velocity (ft/sec)	3.48

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	38.91	4.28	0.06	1.915	28.085
Parallel Bar P-1-7/8	1.50	2.88	0.27	7.638	20.447
Combination			0.32	9.553	20.447

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Grade
Date: 03/15/2006Project No. :18476-Pod 3
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT E
NODE J-55
INLET B

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0050
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	30.000
T	Width of Spread (ft)	29.26

Gutter Flow

Eo	Gutter Flow Ratio	0.147
d	Depth of Flow (ft)	0.68
V	Average Velocity (ft/sec)	3.48

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	38.91	5.75	0.06	1.874	28.126
Parallel Bar P-1-7/8	1.50	4.38	0.41	11.489	16.636
Combination			0.45	13.364	16.636

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway Pavements

Inlets on Grade
Date: 03/15/2006

Project No. :18476-Pod 3
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT E
NODE J-55
INLET C

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0056
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	17.000
T	Width of Spread (ft)	22.99

Gutter Flow

Eo	Gutter Flow Ratio	0.190
d	Depth of Flow (ft)	0.55
V	Average Velocity (ft/sec)	3.17

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	28.97	7.25	0.08	1.420	15.580
Parallel Bar P-1-7/8	1.50	5.88	0.60	9.380	6.201
Combination			0.64	10.799	6.201

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway Pavements

Inlets on Grade
Date: 03/15/2006

Project No. :18476-Pod 3
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT E
NODE J-\$5
INLET D

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0108
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	29.000
T	Width of Spread (ft)	24.96

Gutter Flow

Eo	Gutter Flow Ratio	0.174
d	Depth of Flow (ft)	0.59
V	Average Velocity (ft/sec)	4.60

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	45.58	4.25	0.05	1.550	27.450
Parallel Bar P-1-7/8	1.50	2.88	0.25	6.927	20.523
Combination			0.29	8.477	20.523

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Grade
Date: 03/15/2006Project No. :18476-Pod 3
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT E
NODE J-55
INLET E

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0108
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	30.000
T	Width of Spread (ft)	25.28

Gutter Flow

Eo	Gutter Flow Ratio	0.172
d	Depth of Flow (ft)	0.60
V	Average Velocity (ft/sec)	4.64

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	46.46	5.75	0.05	1.573	28.427
Parallel Bar P-1-7/8	1.50	4.38	0.34	9.785	18.641
Combination			0.38	11.359	18.641

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Grade
Date: 03/15/2006Project No. :18476-Pod 3
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT E
NODE J-55
INLET F

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0183
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	21.000
T	Width of Spread (ft)	19.85

Gutter Flow

Eo	Gutter Flow Ratio	0.221
d	Depth of Flow (ft)	0.49
V	Average Velocity (ft/sec)	5.23

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	42.56	7.25	0.06	1.201	19.799
Parallel Bar P-1-7/8	1.50	5.88	0.45	8.933	10.865
Combination			0.48	10.135	10.865

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Grade
Date: 03/15/2006Project No. :18476-Pod 3
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT E
NODE J-S5
INLET G

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0162
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	19.000
T	Width of Spread (ft)	19.55

Gutter Flow

Eo	Gutter Flow Ratio	0.225
d	Depth of Flow (ft)	0.49
V	Average Velocity (ft/sec)	4.88

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	39.09	7.25	0.06	1.182	17.818
Parallel Bar P-1-7/8	1.50	5.88	0.48	8.466	9.353
Combination			0.51	9.647	9.353

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Grade
Date: 03/15/2006Project No. :18476-Pod 3
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT E
NODE J-§5
INLET H

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0112
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	36.000
T	Width of Spread (ft)	26.91

Gutter Flow

Eo	Gutter Flow Ratio	0.161
d	Depth of Flow (ft)	0.63
V	Average Velocity (ft/sec)	4.92

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	51.91	4.25	0.05	1.692	34.308
Parallel Bar P-1-7/8	1.50	2.88	0.23	7.941	26.367
Combination			0.27	9.633	26.367

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Grade
Date: 03/15/2006Project No. :18476-Pod 3
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

COMMON EASEMENT E
NODE J-~~5~~5
INLET J

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0112
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	35.000
T	Width of Spread (ft)	26.62

Gutter Flow

Eo	Gutter Flow Ratio	0.162
d	Depth of Flow (ft)	0.63
V	Average Velocity (ft/sec)	4.89

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	51.09	4.25	0.05	1.671	33.329
Parallel Bar P-1-7/8	1.50	2.88	0.23	7.800	25.529
Combination			0.27	9.471	25.529

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway PavementsInlets on Sag
Date: 03/10/2006Project No. :18449
Project Name.:GOLDEN VALLEY RANCH
Computed by :rjmProject Description
SAG INLETS - ALL PODS
MODIFIED "C" L-14.5
INLET L

Inlets on Sag: Sweeper Combination Inlet

Roadway and Discharge Data

	Cross Slope	Composite/Dep
Sx	Pavement Cross Slope (ft/ft)	0.0100
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00

Inlet Interception

	Inlet Type *Sag*	Curb-Opening
L	Curb-Opening Length (ft)	5.75
H	Curb-Opening Height (in)	6.00
	Inlet Type *Sag*	Parallel Bar P-1-7/8
T	Width of Spread (ft)	39.39
WGR	Grate Width (ft)	1.50
L	Grate Length (ft)	5.88
	Inlet Type *Sag*	Sweeper Combination
d_ave	Depth of Flow (ft)	0.525
d_curb	Depth at Curb (ft)	0.671
Qi	Intercepted Flow (cfs)	12.000

Note: The curb opening length in the input screen is the total of the curb opening including its length along the grate.

Worksheet

Worksheet for Triangular Channel

Project Description	
Worksheet	CE-E Drainage Easement - Triangular
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.020
Channel Slope	0.005000 ft/ft
Left Side Slope	28.80 H : V
Right Side Slope	28.80 H : V
Discharge	69.00 cfs

Results	
Depth	0.89 ft
Flow Area	22.6 ft ²
Wetted Perimeter	51.07 ft
Top Width	51.04 ft
Critical Depth	0.81 ft
Critical Slope	0.007868 ft/ft
Velocity	3.05 ft/s
Velocity Head	0.14 ft
Specific Energy	1.03 ft
Froude Number	0.81
Flow Type	Subcritical

VELOCITY x DEPTH

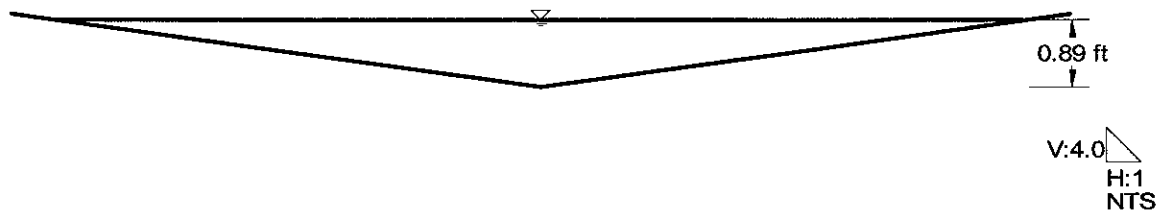
$$3.1 \times 0.9 = 2.8 < 6.0$$

Cross Section

Cross Section for Triangular Channel

Project Description	
Worksheet	CE-F Drainage Easement - Triangular
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.020
Channel Slope	0.005000 ft/ft
Depth	0.89 ft
Left Side Slope	28.80 H : V
Right Side Slope	28.80 H : V
Discharge	69.00 cfs



SD PIPES

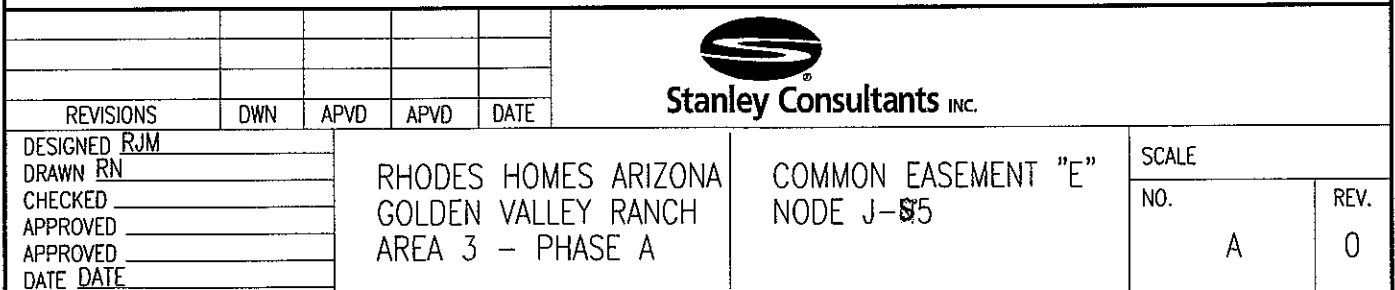
BUBBLE-UP STR

REVISIONS	DWN	APVD	APVD	DATE



SCALE 1" = 100'

ST-RH036676



F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

GOLDEN VALLEY RANCH

HEADING LINE NO 2 IS -

GOLDEN VALLEY

HEADING LINE NO 3 IS -

STORM DRAIN NEAR ROUNDABOUT IN POD3 WITH 1.00 YR FLOW 34CFS

ST-RH036678

DATE: 3/15/2006
TIME: 13:33

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	24	4			2.00														
CD	18	4			1.50														
CD	30	4			2.50														

ST-RH036679

P 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *
 U/S DATA STATION INVERT SECT W S ELEV
 100.00 2553.50 30 2558.20

ELEMENT NO 2 IS A REACH * * *
 U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
 605.00 2562.55 30 0.013 0.00 0.00 0.00 0

ELEMENT NO 3 IS A JUNCTION * * * * *
 U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
 610.00 2562.60 30 0 0 0.013 0.0 0.0 0.00 0.00 0.00 0.00

ELEMENT NO 4 IS A REACH * * *
 U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
 816.00 2563.13 30 0.013 0.00 0.00 0.00 0

ELEMENT NO 5 IS A JUNCTION * * * * *
 U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
 821.00 2563.65 30 18 0 0.013 15.0 0.0 2563.65 0.00 90.00 0.00

WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS

ELEMENT NO 6 IS A REACH * * *
 U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
 861.00 2565.76 18 0.013 0.00 0.00 0.00 0

ELEMENT NO 7 IS A SYSTEM HEADWORKS * *
 U/S DATA STATION INVERT SECT W S ELEV
 861.00 2565.76 18 0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

ST-RH036680

LICENSEE: STANLEY CONSULTANTS, INC.

F0515P

PAGE 1

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH
GOLDEN VALLEY
STORM DRAIN NEAR ROUNDABOUT IN POD3 WITH 100 YR FLOW 34CFS

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH				
100.00	2553.50	4.700	2558.200	26.0	5.30	0.436	2558.636	0.00	1.738	2.50	0.00	0.00	0	0.00
158.24	0.01792					.003984	0.63			1.210		0.00		
258.24	2556.34	2.500	2558.836	26.0	5.30	0.436	2559.272	0.00	1.738	2.50	0.00	0.00	0	0.00
4.22	0.01792					.003755	0.02			1.210		0.00		
262.46	2556.41	2.435	2558.847	26.0	5.33	0.442	2559.289	0.00	1.738	2.50	0.00	0.00	0	0.00
HYDRAULIC JUMP												0.00		
262.46	2556.41	1.210	2557.622	26.0	11.05	1.894	2559.516	0.00	1.738	2.50	0.00	0.00	0	0.00
93.22	0.01792					.017962	1.67			1.210		0.00		
355.68	2558.08	1.210	2559.292	26.0	11.05	1.894	2561.186	0.00	1.738	2.50	0.00	0.00	0	0.00
128.20	0.01792					.017422	2.23			1.210		0.00		
483.88	2560.38	1.231	2561.610	26.0	10.79	1.809	2563.419	0.00	1.738	2.50	0.00	0.00	0	0.00
57.38	0.01792					.015875	0.91			1.210		0.00		
541.26	2561.41	1.278	2562.686	26.0	10.29	1.644	2564.330	0.00	1.738	2.50	0.00	0.00	0	0.00
25.30	0.01792					.013989	0.35			1.210		0.00		
566.56	2561.86	1.328	2563.189	26.0	9.81	1.495	2564.684	0.00	1.738	2.50	0.00	0.00	0	0.00
15.03	0.01792					.012339	0.19			1.210		0.00		
581.59	2562.13	1.380	2563.511	26.0	9.36	1.359	2564.870	0.00	1.738	2.50	0.00	0.00	0	0.00
9.89	0.01792					.010891	0.11			1.210		0.00		
591.48	2562.31	1.434	2563.742	26.0	8.92	1.235	2564.977	0.00	1.738	2.50	0.00	0.00	0	0.00
6.55	0.01792					.009622	0.06			1.210		0.00		
598.03	2562.43	1.492	2563.917	26.0	8.51	1.123	2565.040	0.00	1.738	2.50	0.00	0.00	0	0.00
4.37	0.01792					.008515	0.04			1.210		0.00		

ST-RH036681

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F0515P

PAGE 2

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH

GOLDEN VALLEY

STORM DRAIN NEAR ROUNDABOUT IN POD3 WITH 100 YR FLOW 34CFS

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
602.40	2562.50	1.553	2564.056	26.0	8.11	1.021	2565.077	0.00	1.738	2.50	0.00	0.00	0	0.00
2.60	0.01792					.007548	0.02		1.210			0.00		
605.00	2562.55	1.619	2564.169	26.0	7.73	0.928	2565.097	0.00	1.738	2.50	0.00	0.00	0	0.00
JUNCT STR	0.01000					.006468	0.03					0.00		
610.00	2562.60	1.738	2564.338	26.0	7.14	0.791	2565.129	0.00	1.738	2.50	0.00	0.00	0	0.00
2.09	0.00257					.005525	0.01		2.500			0.00		
612.09	2562.61	1.816	2564.421	26.0	6.81	0.719	2565.140	0.00	1.738	2.50	0.00	0.00	0	0.00
8.28	0.00257					.004944	0.04		2.500			0.00		
620.37	2562.63	1.901	2564.528	26.0	6.49	0.654	2565.182	0.00	1.738	2.50	0.00	0.00	0	0.00
18.97	0.00257					.004448	0.08		2.500			0.00		
639.34	2562.68	1.996	2564.671	26.0	6.19	0.594	2565.265	0.00	1.738	2.50	0.00	0.00	0	0.00
36.29	0.00257					.004032	0.15		2.500			0.00		
675.63	2562.77	2.103	2564.872	26.0	5.90	0.540	2565.412	0.00	1.738	2.50	0.00	0.00	0	0.00
67.99	0.00257					.003704	0.25		2.500			0.00		
743.62	2562.94	2.229	2565.173	26.0	5.62	0.491	2565.664	0.00	1.738	2.50	0.00	0.00	0	0.00
72.38	0.00257					.003519	0.25		2.500			0.00		
816.00	2563.13	2.326	2565.456	26.0	5.46	0.463	2565.919	0.00	1.738	2.50	0.00	0.00	0	0.00
JUNCT STR	0.10400					.002097	0.01					0.00		
821.00	2563.65	2.571	2566.221	11.0	6.23	0.602	2566.823	0.00	1.270	1.50	0.00	0.00	0	0.00
16.83	0.05275					.010966	0.18		0.710			0.00		
837.83	2564.54	1.875	2566.413	11.0	6.23	0.602	2567.015	0.00	1.270	1.50	0.00	0.00	0	0.00
HYDRAULIC JUMP												0.00		

ST-RH036682

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F0515P

PAGE 3

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH

GOLDEN VALLEY

STORM DRAIN NEAR ROUNDABOUT IN POD3 WITH 100 YR FLOW 34CFS

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR	
837.83	2564.54	0.821	2565.359	11.0	11.11	1.917	2567.276	0.00	1.270	1.50	0.00	0.00	0	0.00
4.52	0.05275					.030562	0.14			0.710			0.00	
842.35	2564.78	0.853	2565.629	11.0	10.60	1.744	2567.373	0.00	1.270	1.50	0.00	0.00	0	0.00
4.83	0.05275					.026987	0.13			0.710			0.00	
847.18	2565.03	0.887	2565.918	11.0	10.10	1.584	2567.502	0.00	1.270	1.50	0.00	0.00	0	0.00
3.74	0.05275					.023868	0.09			0.710			0.00	
850.92	2565.23	0.923	2566.151	11.0	9.63	1.441	2567.592	0.00	1.270	1.50	0.00	0.00	0	0.00
2.91	0.05275					.021150	0.06			0.710			0.00	
853.83	2565.38	0.962	2566.344	11.0	9.18	1.309	2567.653	0.00	1.270	1.50	0.00	0.00	0	0.00
2.29	0.05275					.018778	0.04			0.710			0.00	
856.12	2565.50	1.003	2566.506	11.0	8.76	1.191	2567.697	0.00	1.270	1.50	0.00	0.00	0	0.00
1.79	0.05275					.016704	0.03			0.710			0.00	
857.91	2565.60	1.047	2566.644	11.0	8.35	1.082	2567.726	0.00	1.270	1.50	0.00	0.00	0	0.00
1.35	0.05275					.014899	0.02			0.710			0.00	
859.26	2565.67	1.094	2566.762	11.0	7.96	0.984	2567.746	0.00	1.270	1.50	0.00	0.00	0	0.00
0.95	0.05275					.013340	0.01			0.710			0.00	
860.21	2565.72	1.146	2566.864	11.0	7.59	0.894	2567.758	0.00	1.270	1.50	0.00	0.00	0	0.00
0.60	0.05275					.012008	0.01			0.710			0.00	
860.81	2565.75	1.203	2566.953	11.0	7.24	0.813	2567.766	0.00	1.270	1.50	0.00	0.00	0	0.00
0.19	0.05275					.010892	0.00			0.710			0.00	
861.00	2565.76	1.270	2567.030	11.0	6.89	0.738	2567.768	0.00	1.270	1.50	0.00	0.00	0	0.00

ST-RH036683

GOLDEN VALLEY RANCH
GOLDEN VALLEY
STORM DRAIN NEAR ROUNDABOUT IN POD3 WITH 100 YR FLOW 34CFS

[illegible]

NOTES

1. GLOSSARY

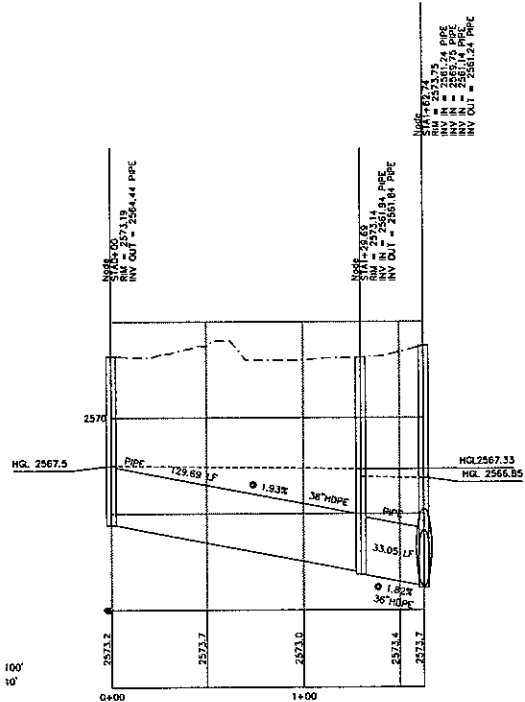
I = INVERT ELEVATION
 C = CRITICAL DEPTH
 W = WATER SURFACE ELEVATION
 H = HEIGHT OF CHANNEL
 E = ENERGY GRADE LINE
 X = CURVES CROSSING OVER
 B = BRIDGE ENTRANCE OR EXIT
 Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

Q:\18449\dwg\design\SD_PRO\POD3\POD3_Bdr_6str.dwg, 3/16/2006 6:03:30 PM, \\vg-ps1\hp5100-eng, 1:1

\$\$\$\$\$FILENAME\$\$\$\$\$


CADD A1-R3 © STANLEY CONSULTANTS



LEGEND	
---	Existing Grade
—	Finish Grade
---	HGL

JS5_B

north lateral

					SCALE 1:1	
REVISIONS DESIGNED RJM DRAWN RN CHECKED APPROVED APPROVED DATE DATE	DWN APVD APVD DATE	RHODES HOMES ARIZONA GOLDEN VALLEY RANCH AREA 3 - PHASE A			COMMON EASEMENT "E" NODE J-N5	
					NO. A	REV. 0

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

GOLDEN VALLEY RANCH

HEADING LINE NO 2 IS -

GOLDEN VALLEY

HEADING LINE NO 3 IS -

NORTH LATERAL FOR JS5 in POD 3

DATE: 3/14/2006
TIME: 8:57

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	24	4			3.00														
CD	18	4			3.00														

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	1	2	3	4	5
IS A	SYSTEM OUTLET	REACH	JUNCTION	REACH	SYSTEM HEADWORKS
U/S DATA	STATION	STATION	STATION	STATION	STATION
	100.00	130.00	135.00	260.00	260.00
INVERT	2561.24	2561.84	2561.94	2564.44	2564.44
SECT	24	24	24	18	18
W S ELEV	2566.85				0.00
N		0.013	0.013	0.013	
RADIUS		0.00		0.00	
ANGLE		0.00		0.00	
ANG PT		0.00		0.00	
MAN H		0		0	
SECT LAT-1			18		
LAT-2			0		
Q3			11.0		
Q4			0.0		
INVERT-3			2561.94		
INVERT-4			0.00		
PHI 3			90.00		
PHI 4			0.00		

WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: STANLEY CONSULTANTS, INC.

F0515P

PAGE 1

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH
GOLDEN VALLEY
LATERAL WITH 106CFS

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBER
L/ELEM	SO					SP AVE	HF		NORM DEPTH			ZR		
100.00	2561.24	5.610	2566.850	34.0	4.81	0.359	2567.209	0.00	1.894	3.00	0.00	0.00	0	0.00
30.00	0.02000					.002599	0.08		1.244			0.00		
130.00	2561.84	5.088	2566.928	34.0	4.81	0.359	2567.287	0.00	1.894	3.00	0.00	0.00	0	0.00
JUNCT STR	0.02000					.001894	0.01					0.00		
135.00	2561.94	5.387	2567.327	23.0	3.25	0.164	2567.491	0.00	1.544	3.00	0.00	0.00	0	0.00
125.00	0.02000					.001189	0.15		1.010			0.00		
260.00	2564.44	3.036	2567.476	23.0	3.25	0.164	2567.640	0.00	1.544	3.00	0.00	0.00	0	0.00

ST-RH036689

GOLDEN VALLEY RANCH
GOLDEN VALLEY
LATERAL WITH 106CFS

100.00	I			C		H						W	E		R
103.27	.													.	
106.53	.													.	
109.80	.													.	
113.06	.													.	
116.33	.													.	
119.59	.													.	
122.86	.													.	
126.12	.													.	
129.39	.													.	
132.65	.	I			C			H				W	E		JX
135.92	.	I			C			H					W E		R
139.18	.													.	
142.45	.													.	
145.71	.													.	
148.98	.													.	
152.24	.													.	
155.51	.													.	
158.78	.													.	
162.04	.													.	
165.31	.													.	
168.57	.													.	
171.84	.													.	
175.10	.													.	
178.37	.													.	
181.63	.													.	
184.90	.													.	
188.16	.													.	
191.43	.													.	
194.69	.													.	
197.96	.													.	
201.22	.													.	
204.49	.													.	
207.76	.													.	
211.02	.													.	
214.29	.													.	
217.55	.													.	
220.82	.													.	
224.08	.													.	
227.35	.													.	
230.61	.													.	
233.88	.													.	
237.14	.													.	
240.41	.													.	
243.67	.													.	
246.94	.													.	
250.20	.													.	
253.47	.													.	
256.73	.													.	
260.00	.								I		C		HW E.		R
2561.24	2561.88	2562.52	2563.16	2563.80	2564.44	2565.08	2565.72	2566.36	2567.00	2567.64					

NOTES

1. GLOSSARY

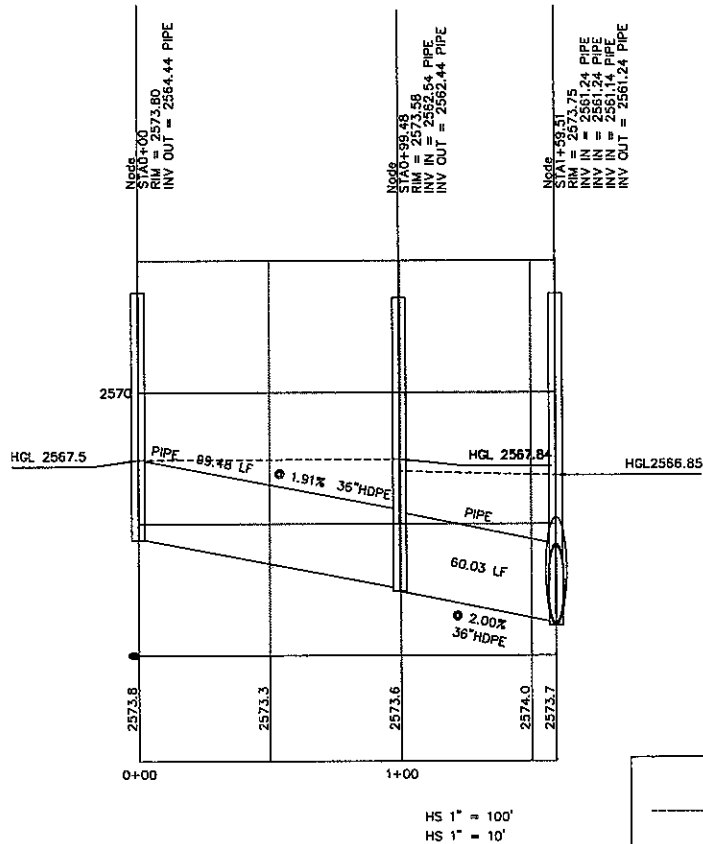
I = INVERT ELEVATION
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H = HEIGHT OF CHANNEL
E = ENERGY GRADE LINE
X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

Q:\18449\dwg\design\SD_PRO\POD3\POD3_Bdr_6str.dwg, 3/16/2006 6:03:48 PM, \\vg-ps1\hp5100-eng, 1:1


\$\$\$\$\$FILENAME\$\$\$\$\$

CADD A1-R3 © STANLEY CONSULTANTS



JS5_B2
south lateral

LEGEND	
---	Existing Grade
---	Finish Grade
---	HGL

<div style="text-align: center;">  <p>Stanley Consultants INC.</p> </div>					SCALE 1:1 NO. A REV. 0																																				
<table border="1"> <thead> <tr> <th>REVISIONS</th> <th>DWN</th> <th>APVD</th> <th>APVD</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>DESIGNED RJM</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>DRAWN RN</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CHECKED</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>APPROVED</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>APPROVED</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>DATE DATE</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>					REVISIONS	DWN	APVD	APVD	DATE	DESIGNED RJM					DRAWN RN					CHECKED					APPROVED					APPROVED					DATE DATE					RHODES HOMES ARIZONA GOLDEN VALLEY RANCH AREA 3 - PHASE A COMMON EASEMENT "E" NODE J-N5	
REVISIONS	DWN	APVD	APVD	DATE																																					
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APPROVED																																									
DATE DATE																																									

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

GOLDEN VALLEY RANCH

HEADING LINE NO 2 IS -

GOLDEN VALLEY

HEADING LINE NO 3 IS -

6 STREET AND E DR WITH 100 YR FLOW OF 170CFS

ST-RH036692

DATE: 3/15/2006
TIME: 13:43

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	48	4			4.00														
CD	24	4			2.00														
CD	42	4			3.50														
CD	54	4			4.50														
CD	30	4			2.50														
CD	36	4			3.00														
CD	18	4			1.50														
CD	27	4			2.25														

ST-RH036693

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	1 IS A SYSTEM OUTLET	U/S DATA	STATION	INVERT	SECT	W S ELEV								
			100.00	2552.50	48	2558.50								
ELEMENT NO 2	IS A REACH	U/S DATA	STATION	INVERT	SECT	RADIUS	ANGLE	ANG PT	MAN H					
			510.00	2560.70	48	0.013	0.00	0.00	0					
ELEMENT NO 3	IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
			515.00	2560.80	48	18	0	0.013	12.0	0.0	2560.80	0.00	90.00	0.00
ELEMENT NO 4	IS A REACH	U/S DATA	STATION	INVERT	SECT	RADIUS	ANGLE	ANG PT	MAN H					
			532.00	2561.14	48	0.013	0.00	0.00	0					
ELEMENT NO 5	IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
			537.00	2561.24	48	30	30	0.013	34.0	33.0	2561.24	2561.24	90.00	90.00
WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS														
ELEMENT NO 6	IS A REACH	U/S DATA	STATION	INVERT	SECT	RADIUS	ANGLE	ANG PT	MAN H					
			572.00	2561.94	36	0.013	0.00	0.00	0					
ELEMENT NO 7	IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
			577.00	2562.04	36	18	18	0.013	10.0	10.0	2562.04	2562.04	90.00	90.00
WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS														
ELEMENT NO 8	IS A REACH	U/S DATA	STATION	INVERT	SECT	RADIUS	ANGLE	ANG PT	MAN H					
			727.00	2565.04	27	0.013	0.00	0.00	0					
ELEMENT NO 9	IS A SYSTEM HEADWORKS	U/S DATA	STATION	INVERT	SECT	W S ELEV								
			727.00	2565.04	27	0.00								

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

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F0515P

PAGE 1

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH
GOLDEN VALLEY
6 STREET AND B DR WITH 100 YR FLOW OF 170CFS

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH		ZR		
100.00	2552.50	6.000	2558.500	118.0	9.39	1.369	2559.869	0.00	3.274	4.00	0.00	0.00	0	0.00
105.35	0.02000					.006748	0.71			2.188		0.00		
205.35	2554.61	4.604	2559.211	118.0	9.39	1.369	2560.580	0.00	3.274	4.00	0.00	0.00	0	0.00
												0.00		
HYDRAULIC JUMP														
205.35	2554.61	2.221	2556.828	118.0	16.47	4.212	2561.040	0.00	3.274	4.00	0.00	0.00	0	0.00
141.00	0.02000					.017954	2.53			2.188		0.00		
346.35	2557.43	2.309	2559.736	118.0	15.70	3.825	2563.561	0.00	3.274	4.00	0.00	0.00	0	0.00
61.32	0.02000					.015862	0.97			2.188		0.00		
407.67	2558.65	2.403	2561.056	118.0	14.97	3.478	2564.534	0.00	3.274	4.00	0.00	0.00	0	0.00
36.60	0.02000					.014039	0.51			2.188		0.00		
444.27	2559.39	2.501	2561.886	118.0	14.27	3.162	2565.048	0.00	3.274	4.00	0.00	0.00	0	0.00
24.15	0.02000					.012445	0.30			2.188		0.00		
468.42	2559.87	2.606	2562.474	118.0	13.61	2.874	2565.348	0.00	3.274	4.00	0.00	0.00	0	0.00
16.58	0.02000					.011056	0.18			2.188		0.00		
485.00	2560.20	2.719	2562.919	118.0	12.97	2.613	2565.532	0.00	3.274	4.00	0.00	0.00	0	0.00
11.57	0.02000					.009846	0.11			2.188		0.00		
496.57	2560.43	2.839	2563.270	118.0	12.37	2.376	2565.646	0.00	3.274	4.00	0.00	0.00	0	0.00
7.59	0.02000					.008794	0.07			2.188		0.00		
504.16	2560.58	2.970	2563.553	118.0	11.79	2.160	2565.713	0.00	3.274	4.00	0.00	0.00	0	0.00
4.40	0.02000					.007889	0.03			2.188		0.00		
508.56	2560.67	3.113	2563.784	118.0	11.24	1.963	2565.747	0.00	3.274	4.00	0.00	0.00	0	0.00
1.44	0.02000					.007118	0.01			2.188		0.00		

ST-RH036695

LICENSEE: STANLEY CONSULTANTS, INC.

F0515P

PAGE 2

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH

GOLDEN VALLEY

6 STREET AND B DR WITH 100 YR FLOW OF 170CFS

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EV.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR	
510.00	2560.70	3.274	2563.974	118.0	10.72	1.784	2565.758	0.00	3.274	4.00	0.00	0.00	0	0.00
JUNCT STR	0.02000					.006105	0.03					0.00		
515.00	2560.80	4.181	2564.981	106.0	8.44	1.105	2566.086	0.00	3.116	4.00	0.00	0.00	0	0.00
12.42	0.02000					.005410	0.07			2.051		0.00		
527.42	2561.05	4.000	2565.048	106.0	8.44	1.105	2566.153	0.00	3.116	4.00	0.00	0.00	0	0.00
4.58	0.02000					.005125	0.02			2.051		0.00		
532.00	2561.14	3.920	2565.060	106.0	8.48	1.115	2566.175	0.00	3.116	4.00	0.00	0.00	0	0.00
JUNCT STR	0.02000					.002808	0.01					0.00		
537.00	2561.24	5.760	2567.000	39.0	5.52	0.473	2567.473	0.00	2.033	3.00	0.00	0.00	0	0.00
35.00	0.02000					.003419	0.12			1.343		0.00		
572.00	2561.94	5.180	2567.120	39.0	5.52	0.473	2567.593	0.00	2.033	3.00	0.00	0.00	0	0.00
JUNCT STR	0.02000					.002115	0.01					0.00		
577.00	2562.04	5.811	2567.851	19.0	4.78	0.355	2568.206	0.00	1.525	2.25	0.00	0.00	0	0.00
150.00	0.02000					.003764	0.56			1.034		0.00		
727.00	2565.04	3.376	2568.416	19.0	4.78	0.355	2568.771	0.00	1.525	2.25	0.00	0.00	0	0.00

ST-RH036696

NOTES

I = INVERT ELEVATION
C = CRITICAL DEPTH
W = WATER SURFACE ELEVATION
H = HEIGHT OF CHANNEL
E = ENERGY GRADE LINE
X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT

ST-RH036697

GOLDEN VALLEY RANCH

APPENDIX C

STREET CAPACITY (LOCAL STREETS)

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway Pavements

Inlets on Grade
Date: 03/17/2006

Project No. :18449 - West Loop Road
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

STATION 149+00
INLETS N & S

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0105
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	7.500
T	Width of Spread (ft)	14.80

Gutter Flow

Eo	Gutter Flow Ratio	0.301
d	Depth of Flow (ft)	0.39
V	Average Velocity (ft/sec)	3.32

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	20.58	2.75	0.12	0.875	6.625
Parallel Bar P-1-7/8	1.50	1.38	0.34	2.247	4.379
Combination			0.42	3.121	4.379

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway Pavements

Inlets on Grade
Date: 03/17/2006

Project No. :18449 - West Loop Road
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

STATION 140+50
INLETS N & S

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0105
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	6.800
T	Width of Spread (ft)	14.23

Gutter Flow

Eo	Gutter Flow Ratio	0.313
d	Depth of Flow (ft)	0.38
V	Average Velocity (ft/sec)	3.24

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	19.40	2.75	0.12	0.840	5.960
Parallel Bar P-1-7/8	1.50	1.38	0.35	2.108	3.853
Combination			0.43	2.947	3.853

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway Pavements

Inlets on Grade
Date: 03/17/2006

Project No. :18449 - West Loop Road
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

STATION 135+50
INLETS N & S

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0080
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	5.300
T	Width of Spread (ft)	13.60

Gutter Flow

Eo	Gutter Flow Ratio	0.328
d	Depth of Flow (ft)	0.37
V	Average Velocity (ft/sec)	2.76

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	15.78	2.75	0.15	0.799	4.501
Parallel Bar P-1-7/8	1.50	1.38	0.38	1.713	2.788
Combination			0.47	2.512	2.788

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway Pavements

Inlets on Grade
Date: 03/17/2006

Project No. :18449 - West Loop Road
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

STATION 128+50
INLETS N & S

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0080
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	2.800
T	Width of Spread (ft)	10.48

Gutter Flow

Eo	Gutter Flow Ratio	0.426
d	Depth of Flow (ft)	0.30
V	Average Velocity (ft/sec)	2.39

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	10.71	2.75	0.22	0.611	2.189
Parallel Bar P-1-7/8	1.50	1.38	0.50	1.099	1.090
Combination			0.61	1.710	1.090

Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

FHWA Urban Drainage Design Program, HY-22
Drainage of Highway Pavements

Inlets on Grade
Date: 03/17/2006

Project No. :18449 - West Loop Road
Project Name.:Golden Valley Ranch
Computed by :rjm

Project Description

STATION 125+00
INLETS N & S

Inlets on Grade: Curb Opening, Grate Inlet

Roadway and Discharge Data

	Cross Slope	Composite
S	Longitudinal Slope (ft/ft)	0.0080
Sx	Pavement Cross Slope (ft/ft)	0.0200
Sw	Gutter Cross Slope (ft/ft)	0.0833
n	Manning's Coefficient	0.016
W	Gutter Width (ft)	1.50
a	Gutter Depression (inch)	2.00
Q	Discharge (cfs)	2.100
T	Width of Spread (ft)	9.28

Gutter Flow

Eo	Gutter Flow Ratio	0.478
d	Depth of Flow (ft)	0.28
V	Average Velocity (ft/sec)	2.25

Inlet Interception

INLET INTERCEPTION	LT or WGR (ft)	L (ft)	E	Qi (cfs)	Qb (cfs)
Curb Opening	8.98	2.75	0.26	0.541	1.559
Parallel Bar P-1-7/8	1.50	1.38	0.57	0.887	0.672
Combination			0.68	1.428	0.672

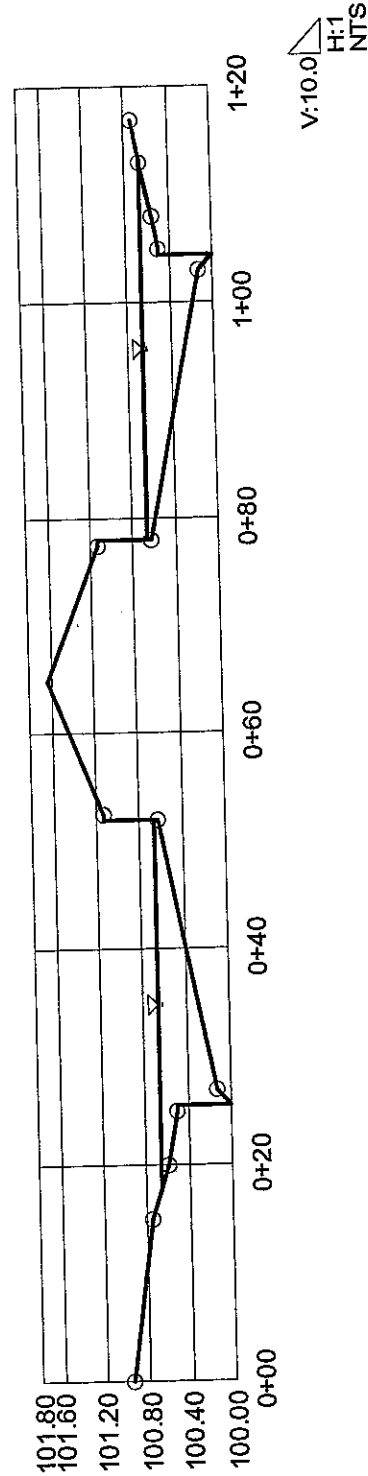
Note: The curb opening length in the input screen is the total length of the curb opening including its length along the grate.

Cross Section

Cross Section for Irregular Channel

STREET CAPACITY @ 8" DEEP (@ BUTTER FC)

Project Description	
Worksheet	West Loop Rd 117R/W
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge
Section Data	
Mannings Coefficient	0.014
Channel Slope	0.005000 ft/ft
Water Surface Elevation	100.67 ft
Elevation Range	100.00 to 101.63
Discharge	53.12 cfs



ST-RH036704

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02/22/06 10:24:36 AM

© Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Stanley Consultants, Inc

Project Engineer: Information Services
FlowMaster v7.0 [7.0005]
Page 1 of 1

Table
Rating Table for Irregular Channel

Project Description	
Worksheet	West Loop Rd 117R/W
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Water Surface Elevation	100.67 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Attribute	Minimum	Maximum	Increment
Channel Slope (ft/ft)	0.005000	0.020000	0.000100

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.005000	53.12	2.93	18.1	70.95	69.83
0.005100	53.65	2.96	18.1	70.95	69.83
0.005200	54.17	2.99	18.1	70.95	69.83
0.005300	54.69	3.01	18.1	70.95	69.83
0.005400	55.21	3.04	18.1	70.95	69.83
0.005500	55.71	3.07	18.1	70.95	69.83
0.005600	56.22	3.10	18.1	70.95	69.83
0.005700	56.72	3.13	18.1	70.95	69.83
0.005800	57.21	3.15	18.1	70.95	69.83
0.005900	57.70	3.18	18.1	70.95	69.83
0.006000	58.19	3.21	18.1	70.95	69.83
0.006100	58.67	3.23	18.1	70.95	69.83
0.006200	59.15	3.26	18.1	70.95	69.83
0.006300	59.63	3.29	18.1	70.95	69.83
0.006400	60.10	3.31	18.1	70.95	69.83
0.006500	60.57	3.34	18.1	70.95	69.83
0.006600	61.03	3.36	18.1	70.95	69.83
0.006700	61.49	3.39	18.1	70.95	69.83
0.006800	61.95	3.41	18.1	70.95	69.83
0.006900	62.40	3.44	18.1	70.95	69.83
0.007000	62.85	3.46	18.1	70.95	69.83
0.007100	63.30	3.49	18.1	70.95	69.83
0.007200	63.75	3.51	18.1	70.95	69.83
0.007300	64.19	3.54	18.1	70.95	69.83
0.007400	64.62	3.56	18.1	70.95	69.83
0.007500	65.06	3.59	18.1	70.95	69.83
0.007600	65.49	3.61	18.1	70.95	69.83
0.007700	65.92	3.63	18.1	70.95	69.83
0.007800	66.35	3.66	18.1	70.95	69.83
0.007900	66.77	3.68	18.1	70.95	69.83
0.008000	67.19	3.70	18.1	70.95	69.83
0.008100	67.61	3.73	18.1	70.95	69.83
0.008200	68.03	3.75	18.1	70.95	69.83
0.008300	68.44	3.77	18.1	70.95	69.83

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.008400	68.85	3.79	18.1	70.95	69.83
0.008500	69.26	3.82	18.1	70.95	69.83
0.008600	69.67	3.84	18.1	70.95	69.83
0.008700	70.07	3.86	18.1	70.95	69.83
0.008800	70.47	3.88	18.1	70.95	69.83
0.008900	70.87	3.91	18.1	70.95	69.83
0.009000	71.27	3.93	18.1	70.95	69.83
0.009100	71.66	3.95	18.1	70.95	69.83
0.009200	72.06	3.97	18.1	70.95	69.83
0.009300	72.45	3.99	18.1	70.95	69.83
0.009400	72.84	4.01	18.1	70.95	69.83
0.009500	73.22	4.04	18.1	70.95	69.83
0.009600	73.61	4.06	18.1	70.95	69.83
0.009700	73.99	4.08	18.1	70.95	69.83
0.009800	74.37	4.10	18.1	70.95	69.83
0.009900	74.75	4.12	18.1	70.95	69.83
0.010000	75.12	4.14	18.1	70.95	69.83
0.010100	75.50	4.16	18.1	70.95	69.83
0.010200	75.87	4.18	18.1	70.95	69.83
0.010300	76.24	4.20	18.1	70.95	69.83
0.010400	76.61	4.22	18.1	70.95	69.83
0.010500	76.98	4.24	18.1	70.95	69.83
0.010600	77.35	4.26	18.1	70.95	69.83
0.010700	77.71	4.28	18.1	70.95	69.83
0.010800	78.07	4.30	18.1	70.95	69.83
0.010900	78.43	4.32	18.1	70.95	69.83
0.011000	78.79	4.34	18.1	70.95	69.83
0.011100	79.15	4.36	18.1	70.95	69.83
0.011200	79.50	4.38	18.1	70.95	69.83
0.011300	79.86	4.40	18.1	70.95	69.83
0.011400	80.21	4.42	18.1	70.95	69.83
0.011500	80.56	4.44	18.1	70.95	69.83
0.011600	80.91	4.46	18.1	70.95	69.83
0.011700	81.26	4.48	18.1	70.95	69.83
0.011800	81.61	4.50	18.1	70.95	69.83
0.011900	81.95	4.52	18.1	70.95	69.83
0.012000	82.29	4.53	18.1	70.95	69.83
0.012100	82.64	4.55	18.1	70.95	69.83
0.012200	82.98	4.57	18.1	70.95	69.83
0.012300	83.32	4.59	18.1	70.95	69.83
0.012400	83.66	4.61	18.1	70.95	69.83
0.012500	83.99	4.63	18.1	70.95	69.83
0.012600	84.33	4.65	18.1	70.95	69.83
0.012700	84.66	4.67	18.1	70.95	69.83
0.012800	84.99	4.68	18.1	70.95	69.83
0.012900	85.33	4.70	18.1	70.95	69.83
0.013000	85.66	4.72	18.1	70.95	69.83
0.013100	85.98	4.74	18.1	70.95	69.83
0.013200	86.31	4.76	18.1	70.95	69.83
0.013300	86.64	4.77	18.1	70.95	69.83
0.013400	86.96	4.79	18.1	70.95	69.83
0.013500	87.29	4.81	18.1	70.95	69.83
0.013600	87.61	4.83	18.1	70.95	69.83

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft ²)	Wetted Perimeter (ft)	Top Width (ft)
0.013700	87.93	4.85	18.1	70.95	69.83
0.013800	88.25	4.86	18.1	70.95	69.83
0.013900	88.57	4.88	18.1	70.95	69.83
0.014000	88.89	4.90	18.1	70.95	69.83
0.014100	89.21	4.92	18.1	70.95	69.83
0.014200	89.52	4.93	18.1	70.95	69.83
0.014300	89.84	4.95	18.1	70.95	69.83
0.014400	90.15	4.97	18.1	70.95	69.83
0.014500	90.46	4.99	18.1	70.95	69.83
0.014600	90.77	5.00	18.1	70.95	69.83
0.014700	91.08	5.02	18.1	70.95	69.83
0.014800	91.39	5.04	18.1	70.95	69.83
0.014900	91.70	5.05	18.1	70.95	69.83
0.015000	92.01	5.07	18.1	70.95	69.83
0.015100	92.31	5.09	18.1	70.95	69.83
0.015200	92.62	5.10	18.1	70.95	69.83
0.015300	92.92	5.12	18.1	70.95	69.83
0.015400	93.23	5.14	18.1	70.95	69.83
0.015500	93.53	5.15	18.1	70.95	69.83
0.015600	93.83	5.17	18.1	70.95	69.83
0.015700	94.13	5.19	18.1	70.95	69.83
0.015800	94.43	5.20	18.1	70.95	69.83
0.015900	94.73	5.22	18.1	70.95	69.83
0.016000	95.03	5.24	18.1	70.95	69.83
0.016100	95.32	5.25	18.1	70.95	69.83
0.016200	95.62	5.27	18.1	70.95	69.83
0.016300	95.91	5.29	18.1	70.95	69.83
0.016400	96.21	5.30	18.1	70.95	69.83
0.016500	96.50	5.32	18.1	70.95	69.83
0.016600	96.79	5.33	18.1	70.95	69.83
0.016700	97.08	5.35	18.1	70.95	69.83
0.016800	97.37	5.37	18.1	70.95	69.83
0.016900	97.66	5.38	18.1	70.95	69.83
0.017000	97.95	5.40	18.1	70.95	69.83
0.017100	98.24	5.41	18.1	70.95	69.83
0.017200	98.52	5.43	18.1	70.95	69.83
0.017300	98.81	5.45	18.1	70.95	69.83
0.017400	99.10	5.46	18.1	70.95	69.83
0.017500	99.38	5.48	18.1	70.95	69.83
0.017600	99.66	5.49	18.1	70.95	69.83
0.017700	99.95	5.51	18.1	70.95	69.83
0.017800	100.23	5.52	18.1	70.95	69.83
0.017900	100.51	5.54	18.1	70.95	69.83
0.018000	100.79	5.55	18.1	70.95	69.83
0.018100	101.07	5.57	18.1	70.95	69.83
0.018200	101.35	5.58	18.1	70.95	69.83
0.018300	101.63	5.60	18.1	70.95	69.83
0.018400	101.90	5.62	18.1	70.95	69.83
0.018500	102.18	5.63	18.1	70.95	69.83
0.018600	102.46	5.65	18.1	70.95	69.83
0.018700	102.73	5.66	18.1	70.95	69.83
0.018800	103.01	5.68	18.1	70.95	69.83
0.018900	103.28	5.69	18.1	70.95	69.83

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft ²)	Wetted Perimeter (ft)	Top Width (ft)
0.019000	103.55	5.71	18.1	70.95	69.83
0.019100	103.82	5.72	18.1	70.95	69.83
0.019200	104.10	5.74	18.1	70.95	69.83
0.019300	104.37	5.75	18.1	70.95	69.83
0.019400	104.64	5.77	18.1	70.95	69.83
0.019500	104.91	5.78	18.1	70.95	69.83
0.019600	105.17	5.80	18.1	70.95	69.83
0.019700	105.44	5.81	18.1	70.95	69.83
0.019800	105.71	5.83	18.1	70.95	69.83
0.019900	105.98	5.84	18.1	70.95	69.83
0.020000	106.24	5.85	18.1	70.95	69.83

Cross Section

Cross Section for Irregular Channel

Project Description	
Worksheet	West Loop Rd 117R/W
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.014
Channel Slope	0.012500 ft/ft
Water Surface Elevation	100.41 ft
Elevation Range	100.00 to 101.63
Discharge	16.44 cfs

11' TRAVEL LANE (INSIDE) CLEAR.

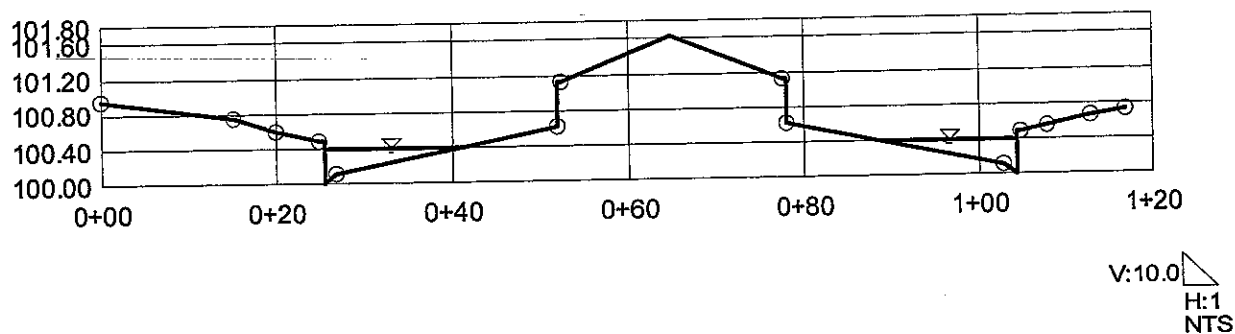


Table
Rating Table for Irregular Channel

Project Description	
Worksheet	West Loop Rd 117R/W
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Water Surface Elevation	100.41 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Attribute	Minimum	Maximum	Increment
Channel Slope (ft/ft)	0.005000	0.020000	0.000100

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft ²)	Wetted Perimeter (ft)	Top Width (ft)
0.005000	10.40	2.10	4.9	31.83	31.00
0.005100	10.50	2.12	4.9	31.83	31.00
0.005200	10.61	2.14	4.9	31.83	31.00
0.005300	10.71	2.16	4.9	31.83	31.00
0.005400	10.81	2.18	4.9	31.83	31.00
0.005500	10.91	2.20	4.9	31.83	31.00
0.005600	11.01	2.22	4.9	31.83	31.00
0.005700	11.10	2.24	4.9	31.83	31.00
0.005800	11.20	2.26	4.9	31.83	31.00
0.005900	11.30	2.28	4.9	31.83	31.00
0.006000	11.39	2.30	4.9	31.83	31.00
0.006100	11.49	2.32	4.9	31.83	31.00
0.006200	11.58	2.34	4.9	31.83	31.00
0.006300	11.67	2.36	4.9	31.83	31.00
0.006400	11.77	2.38	4.9	31.83	31.00
0.006500	11.86	2.40	4.9	31.83	31.00
0.006600	11.95	2.42	4.9	31.83	31.00
0.006700	12.04	2.43	4.9	31.83	31.00
0.006800	12.13	2.45	4.9	31.83	31.00
0.006900	12.22	2.47	4.9	31.83	31.00
0.007000	12.31	2.49	4.9	31.83	31.00
0.007100	12.39	2.50	4.9	31.83	31.00
0.007200	12.48	2.52	4.9	31.83	31.00
0.007300	12.57	2.54	4.9	31.83	31.00
0.007400	12.65	2.56	4.9	31.83	31.00
0.007500	12.74	2.57	4.9	31.83	31.00
0.007600	12.82	2.59	4.9	31.83	31.00
0.007700	12.91	2.61	4.9	31.83	31.00
0.007800	12.99	2.63	4.9	31.83	31.00
0.007900	13.07	2.64	4.9	31.83	31.00
0.008000	13.15	2.66	4.9	31.83	31.00
0.008100	13.24	2.68	4.9	31.83	31.00
0.008200	13.32	2.69	4.9	31.83	31.00
0.008300	13.40	2.71	4.9	31.83	31.00

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft ²)	Wetted Perimeter (ft)	Top Width (ft)
0.008400	13.48	2.72	4.9	31.83	31.00
0.008500	13.56	2.74	4.9	31.83	31.00
0.008600	13.64	2.76	4.9	31.83	31.00
0.008700	13.72	2.77	4.9	31.83	31.00
0.008800	13.80	2.79	4.9	31.83	31.00
0.008900	13.88	2.80	4.9	31.83	31.00
0.009000	13.95	2.82	4.9	31.83	31.00
0.009100	14.03	2.84	4.9	31.83	31.00
0.009200	14.11	2.85	4.9	31.83	31.00
0.009300	14.18	2.87	4.9	31.83	31.00
0.009400	14.26	2.88	4.9	31.83	31.00
0.009500	14.34	2.90	4.9	31.83	31.00
0.009600	14.41	2.91	4.9	31.83	31.00
0.009700	14.49	2.93	4.9	31.83	31.00
0.009800	14.56	2.94	4.9	31.83	31.00
0.009900	14.63	2.96	4.9	31.83	31.00
0.010000	14.71	2.97	4.9	31.83	31.00
0.010100	14.78	2.99	4.9	31.83	31.00
0.010200	14.85	3.00	4.9	31.83	31.00
0.010300	14.93	3.02	4.9	31.83	31.00
0.010400	15.00	3.03	4.9	31.83	31.00
0.010500	15.07	3.05	4.9	31.83	31.00
0.010600	15.14	3.06	4.9	31.83	31.00
0.010700	15.21	3.08	4.9	31.83	31.00
0.010800	15.28	3.09	4.9	31.83	31.00
0.010900	15.36	3.10	4.9	31.83	31.00
0.011000	15.43	3.12	4.9	31.83	31.00
0.011100	15.50	3.13	4.9	31.83	31.00
0.011200	15.57	3.15	4.9	31.83	31.00
0.011300	15.63	3.16	4.9	31.83	31.00
0.011400	15.70	3.17	4.9	31.83	31.00
0.011500	15.77	3.19	4.9	31.83	31.00
0.011600	15.84	3.20	4.9	31.83	31.00
0.011700	15.91	3.22	4.9	31.83	31.00
0.011800	15.98	3.23	4.9	31.83	31.00
0.011900	16.04	3.24	4.9	31.83	31.00
0.012000	16.11	3.26	4.9	31.83	31.00
0.012100	16.18	3.27	4.9	31.83	31.00
0.012200	16.25	3.28	4.9	31.83	31.00
0.012300	16.31	3.30	4.9	31.83	31.00
0.012400	16.38	3.31	4.9	31.83	31.00
0.012500	16.44	3.32	4.9	31.83	31.00
0.012600	16.51	3.34	4.9	31.83	31.00
0.012700	16.57	3.35	4.9	31.83	31.00
0.012800	16.64	3.36	4.9	31.83	31.00
0.012900	16.70	3.38	4.9	31.83	31.00
0.013000	16.77	3.39	4.9	31.83	31.00
0.013100	16.83	3.40	4.9	31.83	31.00
0.013200	16.90	3.42	4.9	31.83	31.00
0.013300	16.96	3.43	4.9	31.83	31.00
0.013400	17.03	3.44	4.9	31.83	31.00
0.013500	17.09	3.45	4.9	31.83	31.00
0.013600	17.15	3.47	4.9	31.83	31.00

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft ²)	Wetted Perimeter (ft)	Top Width (ft)
0.013700	17.21	3.48	4.9	31.83	31.00
0.013800	17.28	3.49	4.9	31.83	31.00
0.013900	17.34	3.50	4.9	31.83	31.00
0.014000	17.40	3.52	4.9	31.83	31.00
0.014100	17.46	3.53	4.9	31.83	31.00
0.014200	17.53	3.54	4.9	31.83	31.00
0.014300	17.59	3.55	4.9	31.83	31.00
0.014400	17.65	3.57	4.9	31.83	31.00
0.014500	17.71	3.58	4.9	31.83	31.00
0.014600	17.77	3.59	4.9	31.83	31.00
0.014700	17.83	3.60	4.9	31.83	31.00
0.014800	17.89	3.62	4.9	31.83	31.00
0.014900	17.95	3.63	4.9	31.83	31.00
0.015000	18.01	3.64	4.9	31.83	31.00
0.015100	18.07	3.65	4.9	31.83	31.00
0.015200	18.13	3.67	4.9	31.83	31.00
0.015300	18.19	3.68	4.9	31.83	31.00
0.015400	18.25	3.69	4.9	31.83	31.00
0.015500	18.31	3.70	4.9	31.83	31.00
0.015600	18.37	3.71	4.9	31.83	31.00
0.015700	18.43	3.72	4.9	31.83	31.00
0.015800	18.49	3.74	4.9	31.83	31.00
0.015900	18.55	3.75	4.9	31.83	31.00
0.016000	18.60	3.76	4.9	31.83	31.00
0.016100	18.66	3.77	4.9	31.83	31.00
0.016200	18.72	3.78	4.9	31.83	31.00
0.016300	18.78	3.80	4.9	31.83	31.00
0.016400	18.84	3.81	4.9	31.83	31.00
0.016500	18.89	3.82	4.9	31.83	31.00
0.016600	18.95	3.83	4.9	31.83	31.00
0.016700	19.01	3.84	4.9	31.83	31.00
0.016800	19.06	3.85	4.9	31.83	31.00
0.016900	19.12	3.86	4.9	31.83	31.00
0.017000	19.18	3.88	4.9	31.83	31.00
0.017100	19.23	3.89	4.9	31.83	31.00
0.017200	19.29	3.90	4.9	31.83	31.00
0.017300	19.34	3.91	4.9	31.83	31.00
0.017400	19.40	3.92	4.9	31.83	31.00
0.017500	19.46	3.93	4.9	31.83	31.00
0.017600	19.51	3.94	4.9	31.83	31.00
0.017700	19.57	3.95	4.9	31.83	31.00
0.017800	19.62	3.97	4.9	31.83	31.00
0.017900	19.68	3.98	4.9	31.83	31.00
0.018000	19.73	3.99	4.9	31.83	31.00
0.018100	19.79	4.00	4.9	31.83	31.00
0.018200	19.84	4.01	4.9	31.83	31.00
0.018300	19.90	4.02	4.9	31.83	31.00
0.018400	19.95	4.03	4.9	31.83	31.00
0.018500	20.00	4.04	4.9	31.83	31.00
0.018600	20.06	4.05	4.9	31.83	31.00
0.018700	20.11	4.07	4.9	31.83	31.00
0.018800	20.17	4.08	4.9	31.83	31.00
0.018900	20.22	4.09	4.9	31.83	31.00

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft ²)	Wetted Perimeter (ft)	Top Width (ft)
0.019000	20.27	4.10	4.9	31.83	31.00
0.019100	20.33	4.11	4.9	31.83	31.00
0.019200	20.38	4.12	4.9	31.83	31.00
0.019300	20.43	4.13	4.9	31.83	31.00
0.019400	20.49	4.14	4.9	31.83	31.00
0.019500	20.54	4.15	4.9	31.83	31.00
0.019600	20.59	4.16	4.9	31.83	31.00
0.019700	20.64	4.17	4.9	31.83	31.00
0.019800	20.70	4.18	4.9	31.83	31.00
0.019900	20.75	4.19	4.9	31.83	31.00
0.020000	20.80	4.20	4.9	31.83	31.00

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

GOLDEN VALLEY RANCH

HEADING LINE NO 2 IS -

GOLDEN VALLEY

HEADING LINE NO 3 IS -

MAIN STORM DRAIN ON WEST LOOP ROAD

ST-RH036714

DATE: 3/ 8/2006
TIME: 17:48

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	84	4			7.00														
CD	72	4			6.00														
CD	30	4			4.00														
CD	66	4			5.50														
CD	24	4			2.00														
CD	36	4			3.00														

WLPR
West loop road

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	1 IS A SYSTEM OUTLET	U/S DATA	STATION	INVERT	SECT	W S ELEV								
			100.00	2468.21	84	2475.00								
ELEMENT NO	2 IS A REACH	U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H				
			277.00	2469.17	84	0.013	0.00	0.00	53.00	0				
ELEMENT NO	3 IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
			282.00	2469.19	84	0	0	0.013	0.0	0.0	0.00	0.00	0.00	0.00
ELEMENT NO	4 IS A REACH	U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H				
			554.00	2470.56	84	0.013	0.00	0.00	0.00	0				
ELEMENT NO	5 IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
			559.00	2470.58	84	0	0	0.013	0.0	0.0	0.00	0.00	0.00	0.00
ELEMENT NO	6 IS A REACH	U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H				
			656.00	2471.06	84	0.013	0.00	0.00	6.00	0				
ELEMENT NO	7 IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
			661.00	2471.08	84	0	0	0.013	0.0	0.0	0.00	0.00	0.00	0.00
ELEMENT NO	8 IS A REACH	U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H				
			808.00	2471.83	84	0.013	0.00	0.00	6.00	0				
ELEMENT NO	9 IS A JUNCTION	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
			813.00	2471.85	84	0	0	0.013	0.0	0.0	0.00	0.00	0.00	0.00

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS A	REACH	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
10	IS A	REACH	965.00	2472.61	84	0.013	0.00	0.00	5.00	0
11	IS A	JUNCTION	970.00	2472.63	84	0	0	0.013	0.0	0.0
12	IS A	REACH	1077.00	2473.17	84	0.013	0.00	0.00	5.00	0
13	IS A	JUNCTION	1082.00	2473.19	84	0	0	0.013	0.0	0.0
14	IS A	REACH	1217.00	2473.87	84	0.013	0.00	0.00	6.00	0
15	IS A	JUNCTION	1222.00	2473.89	84	0	0	0.013	0.0	0.0
16	IS A	REACH	1275.00	2474.16	84	0.013	0.00	0.00	0.00	0
17	IS A	JUNCTION	1280.00	2474.18	84	24	0	0.013	66.0	0.0
18	IS A	REACH	1680.00	2476.18	84	0.013	0.00	0.00	0.00	0
19	IS A	JUNCTION	1685.00	2476.20	84	0	0	0.013	0.0	0.0

ST-RH036717

F 0 5 1 5 P

PAGE NO 4

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS A	REACH	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
20	IS A	REACH	1827.00	2476.92	84	0.013	0.00	0.00	0.00	0
21	IS A	JUNCTION	1832.00	2476.94	84	0	0	0	0.013	0.0
22	IS A	REACH	2010.00	2477.83	84	0.013	0.00	0.00	0.00	0
23	IS A	JUNCTION	2015.00	2477.85	84	0	0	0	0.013	0.0
24	IS A	REACH	2154.00	2478.55	84	0.013	0.00	0.00	0.00	0
25	IS A	JUNCTION	2159.00	2478.57	72	36	0	0.013	107.0	0.0
26	IS A	REACH	2277.00	2479.17	72	0.013	0.00	0.00	0.00	0
27	IS A	JUNCTION	2282.00	2479.19	72	0	0	0.013	0.0	0.0
28	IS A	REACH	2457.00	2480.07	72	0.013	0.00	0.00	0.00	0
29	IS A	JUNCTION	2462.00	2480.09	72	0	0	0.013	0.0	0.0

ST-RH036718

F 0 5 1 5 P

PAGE NO 5

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS A	REACH	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO 30	IS A	REACH	2643.00	2481.00	72	0.013	0.00	0.00	5.00	0
ELEMENT NO 31	IS A	JUNCTION	2648.00	2481.02	72	0	0	0.013	0.0	0.0
ELEMENT NO 32	IS A	REACH	2802.00	2481.80	72	0.013	0.00	0.00	0.00	0
ELEMENT NO 33	IS A	JUNCTION	2807.00	2481.82	72	0	0	0.013	0.0	0.0
ELEMENT NO 34	IS A	REACH	2970.00	2482.64	72	0.013	0.00	0.00	0.00	0
ELEMENT NO 35	IS A	JUNCTION	2975.00	2482.66	72	30	0	0.013	39.0	0.0
WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS										
ELEMENT NO 36	IS A	REACH	3145.00	2483.51	66	0.013	0.00	0.00	0.00	0
ELEMENT NO 37	IS A	SYSTEM HEADWORKS	3145.00	2483.51	66		W S ELEV	0.00		

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: STANLEY CONSULTANTS, INC.

F0515P

PAGE 1

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH
GOLDEN VALLEY
MAIN STORM DRAIN ON WEST LOOP ROAD

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/SELM	SO					SF AVE	HF			NORM DEPTH		ZR		
100.00	2468.21	6.790	2475.000	465.0	12.19	2.307	2477.307	0.00	5.659	7.00	0.00	0.00	0	0.00
177.00	0.00542					.004622	0.82			5.665		0.00		
277.00	2469.17	6.568	2475.738	465.0	12.40	2.387	2478.125	0.00	5.659	7.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.004579	0.02					0.00		
282.00	2469.19	6.573	2475.763	465.0	12.39	2.385	2478.148	0.00	5.659	7.00	0.00	0.00	0	0.00
272.00	0.00504					.004609	1.25			5.913		0.00		
554.00	2470.56	6.344	2476.904	465.0	12.68	2.498	2479.402	0.00	5.659	7.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.004638	0.02					0.00		
559.00	2470.58	6.351	2476.931	465.0	12.67	2.494	2479.425	0.00	5.659	7.00	0.00	0.00	0	0.00
97.00	0.00495					.004655	0.45			5.984		0.00		
656.00	2471.06	6.285	2477.345	465.0	12.77	2.531	2479.876	0.00	5.659	7.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.004671	0.02					0.00		
661.00	2471.08	6.293	2477.373	465.0	12.76	2.527	2479.900	0.00	5.659	7.00	0.00	0.00	0	0.00
147.00	0.00510					.004724	0.69			5.865		0.00		
808.00	2471.83	6.145	2477.975	465.0	12.99	2.620	2480.595	0.00	5.659	7.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.004776	0.02					0.00		
813.00	2471.85	6.156	2478.006	465.0	12.97	2.612	2480.618	0.00	5.659	7.00	0.00	0.00	0	0.00
152.00	0.00500					.004815	0.73			5.942		0.00		
965.00	2472.61	6.065	2478.675	465.0	13.13	2.675	2481.350	0.00	5.659	7.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.004851	0.02					0.00		
970.00	2472.63	6.080	2478.710	465.0	13.10	2.665	2481.375	0.00	5.659	7.00	0.00	0.00	0	0.00
107.00	0.00505					.004879	0.52			5.906		0.00		

ST-RH036720

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F0515P

PAGE 2

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH
GOLDEN VALLEY
MAIN STORM DRAIN ON WEST LOOP ROAD

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVEPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1077.00	2473.17	6.013	2479.183	465.0	13.22	2.713	2481.896	0.00	5.659	7.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.004905	0.02					0.00		
1082.00	2473.19	6.031	2479.221	465.0	13.19	2.700	2481.921	0.00	5.659	7.00	0.00	0.00	0	0.00
135.00	0.00504					.004929	0.67		5.913			0.00		
1217.00	2473.87	5.971	2479.841	465.0	13.30	2.746	2482.587	0.00	5.659	7.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.004952	0.02					0.00		
1222.00	2473.89	5.991	2479.881	465.0	13.26	2.730	2482.611	0.00	5.659	7.00	0.00	0.00	0	0.00
53.00	0.00509					.004959	0.26		5.871			0.00		
1275.00	2474.16	5.960	2480.120	465.0	13.32	2.755	2482.875	0.00	5.659	7.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.004439	0.02					0.00		
1280.00	2474.18	7.702	2481.882	399.0	10.37	1.669	2483.551	0.00	5.264	7.00	0.00	0.00	0	0.00
400.00	0.00500					.003901	1.56		5.112			0.00		
1680.00	2476.18	7.263	2483.443	399.0	10.37	1.669	2485.112	0.00	5.264	7.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.003901	0.02					0.00		
1685.00	2476.20	7.262	2483.462	399.0	10.37	1.669	2485.131	0.00	5.264	7.00	0.00	0.00	0	0.00
142.00	0.00507					.003901	0.55		5.083			0.00		
1827.00	2476.92	7.096	2484.016	399.0	10.37	1.669	2485.685	0.00	5.264	7.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.003901	0.02					0.00		
1832.00	2476.94	7.095	2484.035	399.0	10.37	1.669	2485.704	0.00	5.264	7.00	0.00	0.00	0	0.00
86.88	0.00500					.003881	0.34		5.112			0.00		
1918.88	2477.37	7.000	2484.374	399.0	10.37	1.669	2486.043	0.00	5.264	7.00	0.00	0.00	0	0.00
91.12	0.00500					.003679	0.34		5.112			0.00		

ST-RH036721

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F0515P

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WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH
GOLDEN VALLEY
MAIN STORM DRAIN ON WEST LOOP ROAD

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVEPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
2010.00	2477.83	6.863	2484.693	399.0	10.42	1.685	2486.378	0.00	5.264	7.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.003496	0.02					0.00		
2015.00	2477.85	6.860	2484.710	399.0	10.42	1.685	2486.395	0.00	5.264	7.00	0.00	0.00	0	0.00
139.00	0.00504					.003432	0.48		5.097			0.00		
2154.00	2478.55	6.563	2485.113	399.0	10.64	1.759	2486.872	0.00	5.264	7.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.004063	0.02					0.00		
2159.00	2478.57	7.727	2486.297	292.0	10.33	1.656	2487.953	0.00	4.674	6.00	0.00	0.00	0	0.00
118.00	0.00509					.004754	0.56		4.748			0.00		
2277.00	2479.17	7.688	2486.858	292.0	10.33	1.656	2488.514	0.00	4.674	6.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.004754	0.02					0.00		
2282.00	2479.19	7.691	2486.881	292.0	10.33	1.656	2488.537	0.00	4.674	6.00	0.00	0.00	0	0.00
175.00	0.00503					.004754	0.83		4.774			0.00		
2457.00	2480.07	7.643	2487.713	292.0	10.33	1.656	2489.369	0.00	4.674	6.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.004754	0.02					0.00		
2462.00	2480.09	7.647	2487.737	292.0	10.33	1.656	2489.393	0.00	4.674	6.00	0.00	0.00	0	0.00
181.00	0.00503					.004754	0.86		4.775			0.00		
2643.00	2481.00	7.630	2488.630	292.0	10.33	1.656	2490.286	0.00	4.674	6.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.004754	0.02					0.00		
2648.00	2481.02	7.634	2488.654	292.0	10.33	1.656	2490.310	0.00	4.674	6.00	0.00	0.00	0	0.00
154.00	0.00507					.004754	0.73		4.757			0.00		
2802.00	2481.80	7.586	2489.386	292.0	10.33	1.656	2491.042	0.00	4.674	6.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.004754	0.02					0.00		

ST-RH036722

PAGE 4

LICENSEE: STANLEY CONSULTANTS, INC.

F051SP

WATER SURFACE PROFILE LISTING

GOLDEN VALLEY RANCH
GOLDEN VALLEY
MAIN STORM DRAIN ON WEST LOOP ROAD

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
2807.00	2481.82	7.590	2489.410	292.0	10.33	1.656	2491.066	0.00	4.674	6.00	0.00	0.00	0	0.00
163.00	0.00503					.004754	0.77		4.773			0.00		
2970.00	2482.64	7.545	2490.185	292.0	10.33	1.656	2491.841	0.00	4.674	6.00	0.00	0.00	0	0.00
JUNCT STR	0.00400					.004162	0.02					0.00		
2975.00	2482.66	8.238	2490.898	253.0	10.65	1.761	2492.659	0.00	4.435	5.50	0.00	0.00	0	0.00
170.00	0.00500					.005676	0.96		4.945			0.00		
3145.00	2483.51	8.353	2491.863	253.0	10.65	1.761	2493.624	0.00	4.435	5.50	0.00	0.00	0	0.00

ST-RH036723

GOLDEN VALLEY RANCH
GOLDEN VALLEY
MAIN STORM DRAIN ON WEST LOOP ROAD

Altitude (ft)	Observer	Clouds	Wind	Weather	Remarks
100.00	I	C	WH	E	R
141.71	.	.	.	.	.
183.42	.	.	.	.	.
225.14	.	.	.	.	.
266.85	.	C	WH	E	JX
308.56	I	C	WH	E	R
350.27	I	C	WH	E	.
391.99	.	.	.	.	.
433.70	.	.	.	.	.
475.41	.	.	.	.	.
517.12	.	C	WH	E	JX
558.84	I	C	WH	E	R
600.55	I	C	WH	E	.
642.26	.	C	WH	E	JX
683.97	I	C	WH	E	R
725.68	I	C	WH	E	.
767.40	.	C	WH	E	JX
809.11	I	C	WH	E	R
850.82	I	C	WH	E	.
892.53	.	C	WH	E	JX
934.25	.	C	WH	E	R
975.96	I	C	WH	E	.
1017.67	I	C	WH	E	JX
1059.38	.	C	WH	E	R
1101.10	I	C	WH	E	.
1142.81	I	C	WH	E	JX
1184.52	.	C	WH	E	R
1226.23	I	C	WH	E	JX
1267.95	I	C	WH	E	R
1309.66	I	C	WH	E	JX
1351.37	I	C	WH	E	R
1393.08	.	.	.	.	.
1434.79	.	.	.	.	.
1476.51	.	.	.	.	.
1518.22	.	.	.	.	.
1559.93	.	.	.	.	.
1601.64	.	.	.	.	.
1643.36	I	C	HW	E	JX
1685.07	I	C	HW	E	R
1726.78	.	.	.	.	.
1768.49	.	.	.	.	.
1810.21	I	C	HW	E	JX
1851.92	I	C	HW	E	R
1893.63	I	C	HW	E	R
1935.34	I	C	HW	E	.
1977.05	.	C	WH	E	JX
2018.77	I	C	WH	E	R
2060.48	I	C	WH	E	.
2102.19	.	.	.	.	.
2143.90	.	C	WH	E	JX
2185.62	I	C	WH	E	R
2227.33	.	C	WH	E	.
2269.04	.	C	WH	E	JX
2310.75	I	C	WH	E	R
2352.47	I	C	WH	E	.
2394.18	.	.	.	.	.
2435.89	.	.	.	.	JX
2477.60	I	C	WH	E	R
2519.32	I	C	WH	E	.
2561.03	.	.	.	.	.
2602.74	.	C	WH	E	JX
2644.45	I	C	WH	E	R
2686.16	.	.	.	.	.
2727.88	.	.	.	.	.
2769.59	.	.	.	.	JX
2811.30	I	C	WH	E	R
2853.01	I	C	WH	E	.
2894.73	.	.	.	.	.
2936.44	.	C	WH	E	JX
2978.15	I	C	WH	E	R
3019.86	I	C	WH	E	.
3061.58	.	.	.	.	.
3103.29	.	I	C	WH	E
3145.00	.	.	.	.	R

NOTES

1. GLOSSARY

GLOSSARY

I = INVERT ELEVATION
C = CRITICAL DEPTH
W = WATER SURFACE ELEVATION
H = HEIGHT OF CHANNEL
E = ENERGY GRADE LINE
X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT

Y - WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

ST-RH036725

1

CURRENT DATE: 03-20-2006
CURRENT TIME: 11:05:09

FILE DATE: 3/20/2006
FILE NAME: jn5

.....
FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

.....
C . SITE DATA CULVERT SHAPE, MATERIAL, INLET
U
L . INLET OUTLET CULVERT . BARRELS
V . ELEV. ELEV. LENGTH . SHAPE SPAN RISE MANNING INLET
NO. (ft) (ft) (ft) . MATERIAL (ft) (ft) n TYPE
1 . 2501.08 2499.50 144.01 . 1 RCB 7.00 6.00 .013 IMPR SDT REC .
2 .
3 .
4 .
5 .
6 .
.....

.....
SUMMARY OF CULVERT FLOWS (cfs)

FILE: jn5

DATE: 3/20/2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY ITR
2506.36	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2507.16	160.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2507.87	220.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2508.51	280.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2509.11	340.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2509.67	400.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2510.21	460.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2510.72	520.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2511.22	580.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2511.54	621.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2512.28	700.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0 OVERTOPPING

.....

.....
SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: jn5

DATE: 3/20/2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2506.36	0.000	100.00	0.00	0.00
2507.16	0.000	160.00	0.00	0.00
2507.87	0.000	220.00	0.00	0.00
2508.51	0.000	280.00	0.00	0.00
2509.11	0.000	340.00	0.00	0.00
2509.67	0.000	400.00	0.00	0.00
2510.21	0.000	460.00	0.00	0.00
2510.72	0.000	520.00	0.00	0.00

2511.22	0.000	580.00	0.00	0.00
2511.54	0.000	621.00	0.00	0.00
2512.28	0.000	700.00	0.00	0.00

.....
<1> TOLERANCE (ft) = 0.010
.....

<2> TOLERANCE (%) = 1.000

2

CURRENT DATE: 03-20-2006
CURRENT TIME: 11:05:09

FILE DATE: 3/20/2006
FILE NAME: jn5

PERFORMANCE CURVE FOR CULVERT 1 - 1(7.00 (ft) BY 6.00 (ft)) RCB

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	<F4> TYPE (ft)	DEPTH (ft)	DEPTH (ft)	DEPTH (ft)	DEPTH (ft)	CRIT. OUTLET DEPTH (fps)	TW DEPTH (fps)	OUTLET VEL.	TW VEL.
100.00	2506.36	5.28	5.28	1-S2n	1.27	1.85	1.31	1.30	10.87	11.02		
160.00	2507.16	6.08	6.08	5-S2n	1.76	2.54	1.85	1.79	12.38	12.79		
220.00	2507.87	6.79	6.79	5-S2n	2.20	3.14	2.34	2.24	13.45	14.06		
280.00	2508.51	7.43	7.43	5-S2n	2.61	3.68	2.80	2.66	14.26	15.05		
340.00	2509.11	8.03	8.03	5-S2n	3.01	4.19	3.24	3.06	14.98	15.86		
400.00	2509.67	8.59	8.59	5-S2n	3.40	4.67	3.67	3.46	15.56	16.53		
460.00	2510.21	9.13	9.13	5-S2n	3.78	5.13	4.08	3.84	16.11	17.11		
520.00	2510.72	9.64	9.64	5-S2n	4.15	5.57	4.47	4.22	16.63	17.61		
580.00	2511.22	10.13	10.13	5-S2n	4.51	5.99	4.87	4.59	17.02	18.06		
621.00	2511.54	10.46	9.75	5-S2n	4.76	6.00	5.13	4.84	17.29	18.33		
700.00	2512.28	11.07	11.20	6-FFc	5.23	6.00	6.00	5.32	16.67	18.81		

El. inlet face invert 2501.08 ft El. outlet invert 2499.50 ft
El. inlet throat invert 2501.00 ft El. inlet crest 2504.18 ft

**** SITE DATA **** CULVERT INVERT ****

INLET STATION 0.00 ft
INLET ELEVATION 2504.00 ft
OUTLET STATION 152.00 ft
OUTLET ELEVATION 2499.50 ft
NUMBER OF BARRELS 1
SLOPE (V/H) 0.0104
CULVERT LENGTH ALONG SLOPE 144.01 ft

**** CULVERT DATA SUMMARY ****

BARREL SHAPE BOX
BARREL SPAN 7.00 ft
BARREL RISE 6.00 ft
BARREL MATERIAL CONCRETE
BARREL MANNING'S n 0.013
INLET TYPE IMPR SDT RECT
INLET EDGE AND WALL BEVELED EDGE TOP (26-45 DEG WINGWALL)
INLET DEPRESSION YES

3

CURRENT DATE: 03-20-2006
CURRENT TIME: 11:05:09

FILE DATE: 3/20/2006
FILE NAME: jn5

.....
IMPROVED INLET FOR CULVERT 1 - 1(7.00 (ft) BY 6.00 (ft)) RCB
.....

DIS- CHARGE Flow (cfs)	HEAD- WATER Elev. (ft)	INLET CONTROL Depth (ft)	OUTLET CONTROL Depth (ft)	TYPE <P4>	CREST Elev. (ft)	FACE Elev. (ft)	THROAT Elev. (ft)	TAILWATER Elev. (ft)
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100	2506.36	5.28	5.28	1-S2n	2506.36	2503.52	2503.76	2500.80
160	2507.16	6.08	6.08	5-S2n	2507.16	2504.42	2504.77	2501.29
220	2507.87	6.79	6.79	5-S2n	2507.87	2505.21	2505.68	2501.74
280	2508.51	7.43	7.43	5-S2n	2508.51	2505.93	2506.50	2502.16
340	2509.11	8.03	8.03	5-S2n	2509.11	2506.60	2507.27	2502.56
400	2509.67	8.59	8.59	5-S2n	2509.67	2507.63	2508.01	2502.96
460	2510.21	9.13	9.13	5-S2n	2510.21	2508.08	2508.72	2503.34
520	2510.72	9.64	9.64	5-S2n	2510.72	2508.59	2509.45	2503.72
580	2511.22	10.13	10.13	5-S2n	2511.22	2509.16	2510.19	2504.09
621	2511.54	10.46	9.75	5-S2n	2511.54	2509.59	2510.71	2504.34
700	2512.28	11.07	11.20	6-FFc	2512.15	2510.50	2511.78	2504.82

***** SIDE-TAPERED RECTANGULAR IMPROVED INLET ***
FACE WIDTH 11.00 ft
SIDE TAPER (4:1 TO 6:1) (X:1) 4.00
.....

ST-RH036729

4

CURRENT DATE: 03-20-2006
CURRENT TIME: 11:05:09

FILE DATE: 3/20/2006
FILE NAME: jn5

.....
TAILWATER
.....

***** REGULAR CHANNEL CROSS SECTION *****

BOTTOM WIDTH 7.00 ft
SIDE SLOPE H/V (X:1) 0.0
CHANNEL SLOPE V/H (ft/ft) 0.010
MANNING'S n (.01-0.1) 0.013
CHANNEL INVERT ELEVATION 2499.50 ft
CULVERT NO.1 OUTLET INVERT ELEVATION 2499.50 ft

***** UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
100.00	2500.80	1.705	1.30	11.02	0.81
160.00	2501.29	1.686	1.79	12.79	1.12
220.00	2501.74	1.657	2.24	14.06	1.39
280.00	2502.16	1.627	2.66	15.05	1.66
340.00	2502.56	1.596	3.06	15.86	1.91
400.00	2502.96	1.567	3.46	16.53	2.16
460.00	2503.34	1.538	3.84	17.11	2.40
520.00	2503.72	1.511	4.22	17.61	2.63
580.00	2504.09	1.486	4.59	18.06	2.86
621.00	2504.34	1.469	4.84	18.33	3.02
700.00	2504.82	1.437	5.32	18.81	3.32

.....
ROADWAY OVERTOPPING DATA
.....

ROADWAY SURFACE PAVED
EMBANKMENT TOP WIDTH 100.00 ft
CREST LENGTH 100.00 ft
OVERTOPPING CREST ELEVATION 2513.70 ft
.....

1

CURRENT DATE: 02-28-2006
CURRENT TIME: 15:31:27

FILE DATE: 2/28/2006
FILE NAME: JN25

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.....
FHWA CULVERT ANALYSIS .....
HY-8, VERSION 6.1 .....
.....
C . SITE DATA CULVERT SHAPE, MATERIAL, INLET
U .....
L . INLET OUTLET CULVERT BARRELS
V . ELEV. ELEV. LENGTH SHAPE SPAN RISE MANNING INLET
NO. (ft) (ft) (ft) MATERIAL (ft) (ft) n TYPE
1 2510.00 2509.00 175.00 3 RCP 4.00 4.00 .013 CONVENTIONAL
2 . . . . .
3 . . . . .
4 . . . . .
5 . . . . .
6 . . . . .
.....

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SUMMARY OF CULVERT FLOWS (cfs) FILE: JN25 DATE: 2/28/2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY ITR
2510.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2511.27	36.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2511.99	72.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2512.57	108.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2513.07	144.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2513.28	160.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2513.99	216.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2514.47	252.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2515.00	288.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2515.60	324.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2516.27	360.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0 OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: JN25 DATE: 2/28/2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2510.00	0.000	0.00	0.00	0.00
2511.27	0.000	36.00	0.00	0.00
2511.99	0.000	72.00	0.00	0.00
2512.57	0.000	108.00	0.00	0.00
2513.07	0.000	144.00	0.00	0.00
2513.28	0.000	160.00	0.00	0.00
2513.99	0.000	216.00	0.00	0.00
2514.47	0.000	252.00	0.00	0.00

ST-RH036731

2515.00	0.000	288.00	0.00	0.00
2515.60	0.000	324.00	0.00	0.00
2516.27	0.000	360.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010

<2> TOLERANCE (%) = 1.000

2

CURRENT DATE: 02-28-2006
CURRENT TIME: 15:31:27

FILE DATE: 2/28/2006
FILE NAME: JN25

PERFORMANCE CURVE FOR CULVERT 1 - 3(4.00 (ft) BY 4.00 (ft)) RCP

DIS- CHARGE FLOW (cfs)	HEAD- ELEV. (ft)	INLET DEPTH (ft)	OUTLET DEPTH (ft)	<F4> TYPE (ft)	DEPTH (ft)	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (fps)	TW DEPTH (fps)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	2510.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36.00	2511.27	1.27	1.27	1-S2n	0.88	0.99	0.79	0.50	6.78	5.73	
72.00	2511.99	1.99	1.99	1-S2n	1.27	1.43	1.28	0.74	6.92	7.13	
108.00	2512.58	2.58	2.58	1-S2n	1.58	1.78	1.48	0.92	8.52	8.06	
144.00	2513.07	3.07	3.07	1-S2n	1.86	2.07	1.77	1.13	8.93	9.04	
160.00	2513.28	3.28	3.28	1-S2n	1.98	2.19	1.89	1.20	9.15	9.35	
216.00	2513.99	3.99	3.99	1-S2n	2.38	2.56	2.26	1.32	9.85	9.84	
252.00	2514.47	4.47	4.47	5-S2n	2.64	2.78	2.58	1.43	9.84	10.28	
288.00	2515.00	5.00	5.00	5-S2n	2.93	2.96	2.86	1.53	10.00	10.67	
324.00	2515.60	5.60	5.52	2-M2c	3.27	3.14	3.14	1.62	10.23	11.02	
360.00	2516.27	6.27	6.00	2-M2c	4.00	3.28	3.28	1.71	10.90	11.34	

El. inlet face invert 2510.00 ft El. outlet invert 2509.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 2510.00 ft

**** SITE DATA **** CULVERT INVERT ****

INLET STATION 100.00 ft
INLET ELEVATION 2510.00 ft
OUTLET STATION 275.00 ft
OUTLET ELEVATION 2509.00 ft
NUMBER OF BARRELS 3
SLOPE (V/H) 0.0057
CULVERT LENGTH ALONG SLOPE 175.00 ft

**** CULVERT DATA SUMMARY ****

BARREL SHAPE CIRCULAR
BARREL DIAMETER 4.00 ft
BARREL MATERIAL CONCRETE
BARREL MANNING'S n 0.013
INLET TYPE CONVENTIONAL
INLET EDGE AND WALL SQUARE EDGE WITH HEADWALL
INLET DEPRESSION NONE

3

CURRENT DATE: 02-28-2006
CURRENT TIME: 15:31:27

FILE DATE: 2/28/2006
FILE NAME: JN25

.....
TAILWATER
.....

***** REGULAR CHANNEL CROSS SECTION *****

BOTTOM WIDTH 10.00 ft
SIDE SLOPE H/V (X:1) 5.0
CHANNEL SLOPE V/H (ft/ft) 0.030
MANNING'S n (.01-0.1) 0.025
CHANNEL INVERT ELEVATION 2509.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION 2509.00 ft

***** UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2509.00	0.000	0.00	0.00	0.00
36.00	2509.50	1.562	0.50	5.73	0.94
72.00	2509.74	1.648	0.74	7.13	1.38
108.00	2509.92	1.698	0.92	8.06	1.72
144.00	2510.13	1.747	1.13	9.04	2.12
160.00	2510.20	1.761	1.20	9.35	2.25
216.00	2510.32	1.784	1.32	9.84	2.47
252.00	2510.43	1.803	1.43	10.28	2.68
288.00	2510.53	1.820	1.53	10.67	2.86
324.00	2510.62	1.834	1.62	11.02	3.04
360.00	2510.71	1.847	1.71	11.34	3.20

.....
ROADWAY OVERTOPPING DATA
.....

ROADWAY SURFACE PAVED
EMBANKMENT TOP WIDTH 40.00 ft
CREST LENGTH 200.00 ft
OVERTOPPING CREST ELEVATION 2517.50 ft
.....

ST-RH036734

1

CURRENT DATE: 03-20-2006
CURRENT TIME: 13:55:30

FILE DATE: 3/20/2006
FILE NAME: JH

.....
FHWA CULVERT ANALYSIS

HY-8, VERSION 6.1

.....
C . SITE DATA . CULVERT SHAPE, MATERIAL, INLET
U
L . INLET OUTLET CULVERT . BARRELS
V . ELEV. ELEV. LENGTH . SHAPE SPAN RISE MANNING INLET
NO. (ft) (ft) (ft) . MATERIAL (ft) (ft) n TYPE
1 . 2520.00 2518.00 210.01 . 2 RCP 4.00 4.00 .013 CONVENTIONAL
2
3
4
5
6
.....

.....
SUMMARY OF CULVERT FLOWS (cfs)

FILE: JH

DATE: 3/20/2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY ITR
2522.02	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2522.57	75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2523.03	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2523.45	125.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2523.86	150.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2524.29	175.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2524.75	200.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2524.96	210.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2525.86	250.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2526.93	275.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
2527.25	300.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0 OVERTOPPING

.....

.....
SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: JH

DATE: 3/20/2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2522.02	0.000	50.00	0.00	0.00
2522.57	0.000	75.00	0.00	0.00
2523.03	0.000	100.00	0.00	0.00
2523.45	0.000	125.00	0.00	0.00
2523.86	0.000	150.00	0.00	0.00
2524.29	0.000	175.00	0.00	0.00
2524.75	0.000	200.00	0.00	0.00
2524.96	0.000	210.00	0.00	0.00

ST-RH036735

2525.86	0.000	250.00	0.00	0.00
2526.93	0.000	275.00	0.00	0.00
2527.25	0.000	300.00	0.00	0.00

.....
<1> TOLERANCE (ft) = 0.010
.....

<2> TOLERANCE (%) = 1.000

FILE DATE: 3/20/2006
FILE NAME: JH

PERFORMANCE CURVE FOR CULVERT 1 - 2(4.00 (ft) BY 4.00 (ft)) RCP

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	INLET TYPE <F4> (ft)	OUTLET FLOW DEPTH (ft)	NORMAL CRIT. DEPTH (ft)	OUTLET TW DEPTH (fps)	OUTLET TW VEL. (fps)
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50.00	2522.02	2.02	2.02	1-S2n	1.13	1.47	1.07	1.29	9.23	9.71
75.00	2522.57	2.57	2.57	1-S2n	1.40	1.81	1.31	1.73	10.39	10.86
100.00	2523.03	3.03	3.03	1-S2n	1.65	2.11	1.66	2.14	10.11	11.69
125.00	2523.45	3.45	3.45	1-S2n	1.87	2.38	1.78	2.54	11.53	12.32
150.00	2523.86	3.86	3.86	1-S2n	2.08	2.61	2.01	2.93	11.85	12.82
175.00	2524.29	4.29	4.29	5-S2n	2.29	2.83	2.23	3.31	12.14	13.24
200.00	2524.75	4.75	4.75	5-S2n	2.50	3.02	2.52	3.83	12.02	13.71
210.00	2524.96	4.96	4.47	4-FFt	2.59	3.09	2.59	4.05	12.24	13.89
250.00	2525.86	5.86	5.85	4-FFt	2.95	3.33	2.95	4.42	12.59	14.15
275.00	2526.93	6.52	6.93	4-FFt	3.21	3.46	4.00	4.78	10.94	14.38
300.00	2527.25	7.25	6.65	3-M1f	4.00	3.59	4.00	5.15	11.94	14.58

El. inlet face invert	2520.00 ft	El. outlet invert	2518.00 ft
El. inlet throat invert	0.00 ft	El. inlet crest	2520.00 ft

***** SITE DATA ***** CULVERT INVERT *****

INLET STATION	0.00 ft
INLET ELEVATION	2520.00 ft
OUTLET STATION	210.00 ft
OUTLET ELEVATION	2518.00 ft
NUMBER OF BARRELS	2
SLOPE (V/H)	0.0095
CULVERT LENGTH ALONG SLOPE	210.01 ft

***** CULVERT DATA SUMMARY *****

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	4.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.013
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	GROOVED END PROJECTION
INLET DEPRESSION	NONE

3

CURRENT DATE: 03-20-2006
CURRENT TIME: 13:55:30

FILE DATE: 3/20/2006
FILE NAME: JH

.....
TAILWATER

***** REGULAR CHANNEL CROSS SECTION *****

BOTTOM WIDTH 4.00 ft
SIDE SLOPE H/V (X:1) 0.0
CHANNEL SLOPE V/H (ft/ft) 0.010
MANNING'S n (.01-0.1) 0.013
CHANNEL INVERT ELEVATION 2518.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION 2518.00 ft

***** UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
50.00	2519.29	1.508	1.29	9.71	0.80
75.00	2519.73	1.457	1.73	10.86	1.08
100.00	2520.14	1.408	2.14	11.69	1.34
125.00	2520.54	1.363	2.54	12.32	1.58
150.00	2520.93	1.321	2.93	12.82	1.83
175.00	2521.31	1.283	3.31	13.24	2.06
200.00	2521.83	1.235	3.83	13.71	2.39
210.00	2522.05	1.216	4.05	13.89	2.53
250.00	2522.42	1.186	4.42	14.15	2.76
275.00	2522.78	1.158	4.78	14.38	2.98
300.00	2523.15	1.133	5.15	14.58	3.21

.....
ROADWAY OVERTOPPING DATA

ROADWAY SURFACE PAVED
EMBANKMENT TOP WIDTH 100.00 ft
CREST LENGTH 100.00 ft
OVERTOPPING CREST ELEVATION 2527.90 ft

ST-RH036738

1

CURRENT DATE: 02-28-2006
CURRENT TIME: 11:24:11

FILE DATE: 2/28/2006
FILE NAME: JN2

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.....
FHWA CULVERT ANALYSIS .....
HY-8, VERSION 6.1 .....
.....
C . SITE DATA CULVERT SHAPE, MATERIAL, INLET
U .....
L . INLET OUTLET CULVERT BARRELS
V . ELEV. ELEV. LENGTH SHAPE SPAN RISE MANNING INLET
NO.. (ft) (ft) (ft) MATERIAL (ft) (ft) n TYPE
1 . 2537.50 2536.50 140.00 2 RCP 2.00 2.00 .013 CONVENTIONAL
2 .
3 .
4 .
5 .
6 .
.....

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SUMMARY OF CULVERT FLOWS (cfs) FILE: JN2 DATE: 2/28/2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
2537.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2538.25	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2538.67	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2539.01	16.5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2539.31	22.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2539.61	27.5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2539.69	29.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2540.32	38.5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2540.77	44.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2541.42	49.5	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
2542.24	55.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: JN2 DATE: 2/28/2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
2537.50	0.000	0.00	0.00	0.00
2538.25	0.000	5.50	0.00	0.00
2538.67	0.000	11.00	0.00	0.00
2539.01	0.000	16.50	0.00	0.00
2539.31	0.000	22.00	0.00	0.00
2539.61	0.000	27.50	0.00	0.00
2539.69	0.000	29.00	0.00	0.00
2540.32	0.000	38.50	0.00	0.00

ST-RH036739

2540.77	0.000	44.00	0.00	0.00
2541.42	0.000	49.50	0.00	0.00
2542.24	0.000	55.00	0.00	0.00

.....
<1> TOLERANCE (ft) = 0.010
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<2> TOLERANCE (%) = 1.000

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DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4> (ft)	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (fps)	TW DEPTH (fps)	OUTLET VEL. (ft)	TW VEL. (ft)
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El. inlet face invert	2537.50 ft	El. outlet invert	2536.50 ft
El. inlet throat invert	0.00 ft	El. inlet crest	2537.50 ft

INLET STATION	100.00 ft
INLET ELEVATION	2537.50 ft
OUTLET STATION	240.00 ft
OUTLET ELEVATION	2536.50 ft
NUMBER OF BARRELS	2
SLOPE (V/H)	0.0071
CULVERT LENGTH ALONG SLOPE	140.00 ft

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.013
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

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TAILWATER

***** REGULAR CHANNEL CROSS SECTION *****

BOTTOM WIDTH 10.00 ft
SIDE SLOPE H/V (X:1) 5.0
CHANNEL SLOPE V/H (ft/ft) 0.030
MANNING'S n (.01-0.1) 0.025
CHANNEL INVERT ELEVATION 2537.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION 2536.50 ft

***** UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	2537.00	0.000	0.00	0.00	0.00
5.50	2537.17	1.330	0.17	2.99	0.32
11.00	2537.25	1.415	0.25	3.84	0.48
16.50	2537.32	1.465	0.32	4.42	0.60
22.00	2537.38	1.501	0.38	4.87	0.71
27.50	2537.44	1.535	0.44	5.34	0.83
29.00	2537.48	1.551	0.48	5.57	0.89
38.50	2537.52	1.570	0.52	5.86	0.98
44.00	2537.56	1.587	0.56	6.11	1.05
49.50	2537.60	1.602	0.60	6.35	1.12
55.00	2537.64	1.615	0.64	6.56	1.19

..... ROADWAY OVERTOPPING DATA

ROADWAY SURFACE PAVED
EMBANKMENT TOP WIDTH 40.00 ft

***** USER DEFINED ROADWAY PROFILE

CROSS-SECTION	X	Y
COORD. NO.	ft	ft
1	100.00	2541.40
2	150.00	2540.90
3	250.00	2541.40
4	375.00	2540.77
5	500.00	2542.02

GOLDEN VALLEY RANCH

APPENDIX E

BASE FLOOD ELEVATION (BFE)

- **HEC-RAS OUTPUT**